



Attorney's Docket No. 8151-195944

## PATENT

### IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Hanley, Jr. et al.  
Appl. No.: 09/560,288  
Filed: April 27, 2000  
For: METHOD FOR PRODUCING HUMAN  
INTERVERTEBRAL DISC CELLS

Group Art Unit: 1647  
Examiner: Hayes, R.C.

July 29, 2004

### DECLARATION UNDER RULE 132 OF DR. HELEN GRUBER

I, Dr. Helen E. Gruber, declare and state:

1. That I received my B.S. degree in pre-medicine from the University of Idaho in 1969, my M.S. degree in cell biology, radiation biology and microbiology from Oregon State University in 1974, and my doctorate in cell biology from Oregon State University in 1976. I am presently a faculty member, interdisciplinary PhD program, Department of Biology, at the University of North Carolina at Charlotte, and adjunct professor, Greenville Hospital System/Clemson University Biomedical Cooperative. Also, I have 100 refereed scientific articles in print and have co-authored 11 book chapters. A copy of my CV appears as Exhibit A.
2. That I am a co-inventor of United States patent application Serial No. 09/560,288 filed April 27, 2000 entitled *Method for Producing Human Intervertebral Disc Cells*.
3. That I have read the Office Action dated May 11 2004 and have considered the examiner's position that "The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims." I respectfully disagree.

4. In United States Patent No. 6,080,579, a parent patent of the present application, of which I am a co-inventor, there is disclosed and claimed a method for propagating human intervertebral disc cells. The claims of this application carry the process of the '579 patent one step further in that the disc cells propagated using the method of the '579 patent are used to treat human disc diseases. More specifically, in a preferred embodiment of the claimed method, the surgeon first removes healthy disc tissue from a disc that does not show degenerative changes using an open procedure or a percutaneous procedure (note in particular claim 48). The patient's own disc cells are grown in tissue culture as described in the patent specification. These cells are then provided to the surgeon who places them into a debrided segment of degenerating disc. Over time these cells and their descendents would form appropriate building blocks of disc tissue in the implanted site. A schematic illustration of this procedure is shown in Figure 1 of the patent application.

5. I next note that the Examiner states "[t]he issue remains that the current claims cannot work in adolescents or adults wherein annulus and/or cells no longer exist." Contrary to the examiner's statement, adolescents and adults both have annulus disc cells. The human cells that would be cultured *in vitro* are cells from the annulus. The type of human cells obtained from expansion of disc tissue *in vitro* which are used in the claimed therapeutic composition are cells from the annulus. There is detailed discussion and examples (Note examples 4 and 5, for instance) of the use of annulus cells in the patent application. In my opinion, the patent application provides sufficient guidance for one skilled in the art to provide the claimed composition using disc cells from the annulus.

6. I also note the examiner states that "the specification fails to define what population of disc cells to use or how" and "the type of matrix made by disc cells is dependent on the environment these cells are placed within and on the type of disc cells used, which the claims fail to fully define." The cells to be used to replace annulus cells in the disc are annulus cells derived from a healthy disc site. As noted in previous responses, the notochordal cell population disappears from the disc, and the annulus cells from the inner region populate the central portion of the disc. Therefore, it is most reasonable and effective to use annulus cells in disc cell

therapy.

7. In addition the examiner states that "disc cells are a heterogeneous population of cells with different intrinsic variations in their response to mechanical stimuli, with distinct biosynthesis capabilities, where what constitutes a success regenerative process is unclear within the art, and in which the instant problems in generating a potential successful "treat[ment of] human disc diseases." Although this statement may be correct regarding detailed elements of gene expression for specific genes, we feel that annulus cells implanted into a diseased disc will readily meet the mechanical and structural needs of the implantation site as the cells integrate into the nearby matrix. We have found successful integration with this method when we used the animal model of the sand rat for autologous disc cell implantation. Therefore, it is logical to predict the same response in the human disc.

8. Having shown and claimed the use of annulus cells in the therapeutic compositions of this invention, it is my opinion that it would not require undue experimentation to make and use the invention as claimed.

9. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Helen E. Gruber  
Dr. Helen E. Gruber

July 29, 2004  
Date

## CURRICULUM VITAE

### 1. PERSONAL

**NAME:** Helen Elizabeth Gruber, Ph.D.

**BIRTHDATE:** November 6, 1946

**BIRTHPLACE:** Wallace, Idaho

**CITIZENSHIP:** U.S.A.

**SOCIAL SECURITY NUMBER:** 519-58-0241

**BUSINESS ADDRESS:** Orthopaedic Research Biology  
Department of Orthopaedic Surgery  
Carolinas Medical Center  
PO Box 32861  
Charlotte, North Carolina 28232  
Tel: 704-355-5658; Fax: 704-355-2845  
e-mail: hgruber@carolinas.org

**MARITAL STATUS:** Single

### 2. EDUCATION AND TRAINING

**UNDERGRADUATE:** University of Idaho; Moscow, Idaho;  
B.S., Pre-Med; 1969

**GRADUATE:** Oregon State University; Corvallis, Oregon;  
M.S.; 1974; Cell Biology, Radiation Biology, Microbiology

Oregon State University; Corvallis, Oregon; Ph.D.; 1976; Cell  
Biology, Radiation Biology, Zoology

### 3. POSTDOCTORAL TRAINING

NIH Fellow; Radiation Research Lab, University of Iowa; Iowa City, Iowa; 1976-1978

### 4. MILITARY SERVICE: None

### 5. ACADEMIC APPOINTMENTS

Nov 2002 - Present	Research Group Director, Dept. of Orthopaedic Surgery, Carolinas Medical Center, Charlotte, N.C.
June 1999 – present	Faculty member, Interdisciplinary PhD in Biology program, Univ. N.C. Charlotte
Aug 1997 - Present	Adjunct Professor, Greenville Hospital System/Clemson University Biomedical Cooperative, Clemson, S.C.
July 1994- June 2005	Graduate Faculty appointment, University of North Carolina at Charlotte, Charlotte, North Carolina
March 1994- present	Adjunct Professor, Department of Biology, University of North Carolina at Charlotte, Charlotte, North Carolina

January 1994-present	Senior Scientist and Director of Research Histology Baxter Orthopaedic Research Laboratory Department of Orthopaedic Surgery Carolinas Medical Center, Charlotte, North Carolina
July 1991-November 1993	Research Scientist III Cedars-Sinai Medical Center Los Angeles, California
July 1991-November 1993	Associate Researcher II, Department of Pediatrics University of California at Los Angeles Los Angeles, California
July 1991-November 1993	Associate Faculty UCLA Intercampus Medical Genetics Training Program
July 1989-1991	Associate Researcher I, Department of Pediatrics University of California at Los Angeles Los Angeles, California
1986-1991	Research Scientist II and Director, Skeletal Dysplasia Morphology Laboratory; Department of Pediatrics and Medical Genetics Birth Defects Center, Cedars-Sinai Medical Center Los Angeles, California
1986-1989	Assistant Researcher IV, Department of Pediatrics University of California at Los Angeles Los Angeles, California
1984-1986	Assistant Professor of Research Medicine University of Southern California School of Medicine Department of Medicine, Division of Nephrology Los Angeles, California
1981-1984	Research Fellow, University of Southern California School of Medicine, Division of Nephrology Los Angeles, California (Dr. Shaul G. Massry)
1978-1981	Research Instructor of Medicine University of Washington Stationed at V.A. Medical Center, Tacoma, Washington (Dr. David J. Baylink)
1976-1978	Postdoctoral Fellow, Radiation Research Lab, University of Iowa, Iowa City, Iowa (Dr. J.W. Osborne, advisor)
1974-1976	Research Assistant, Oregon State University Corvallis, Oregon (Dr. David L. Willis, supervisor)
1972-1973	Northwest College and University Association for Science Fellow, Battelle Northwest Laboratories, Richland, Washington (Ph.D. Research conducted under Dr. James C. Hampton)
1970-1972, 1973	Teaching Assistant, General Biology, Department of General Science, Oregon State University, and

## 6. HONORS

- 1984 Listed in Who's Who in Frontier Science and Technology, 1st Ed.
- 1985 Invited Speaker, International Symposium on Magnesium and its Relationship to Cardiovascular, Renal and Metabolic Disorders, February 14, 1985, Workshop on Magnesium and Bone Disorders
- 1986 Appreciation Award, Volunteer Teaching, Griffin Avenue School, Los Angeles, California, June 18, 1986
- 1988 Appreciation Award, Volunteer Teaching, Griffin Avenue School, Los Angeles, California, June 20, 1988
- 1989 Recipient of Departmental Tribute for Distinguished Service, Department of Physical Therapy, University of Southern California, May 1989
- 1989-1990 Ad Hoc Reviewer for Veterans Administration Merit Review Board for Endocrinology
- 1999 Host mentor laboratory, "Implantation methodologies for autologous disc cell therapy". Alpha Omega Alpha Honor Medical Society - funded Student Research Fellowship for David Martin, summer, 1998.
- 2001 Best Basic Science Poster Award, The Cervical Spine Research Society annual meeting. Tenascin in the human intervertebral disc: Alterations with aging and disc degeneration. H.E. Gruber and E.N. Hanley.
- 2001 Kaye E. Wilkins Scientific Poster Award. Pediatric Orthopaedic Society of North America annual meeting. Histologic features of physeal bar formation in physeal fractures. J. Wattenbarger, H.E. Gruber
- 2002 Wattenbarger, JM, A. Marshall, H. Gruber, R. Meyer : The role of the basement plate in physeal bar formation. AOA Residents Conference Award. Poster presentation at the Amer. Orthopaedic Association annual meeting, Victoria, B.C. June 1, 2002.

## 7. PUBLIC AND COMMUNITY SERVICE ACTIVITY

- 1986 Appreciation Award, Volunteer Teaching, Griffin Avenue School, Los Angeles, California, June 18, 1986
- 1988 Appreciation Award, Volunteer Teaching, Griffin Avenue School, Los Angeles, California, June 20, 1988
- 1990 Volunteer Teacher, Griffin Avenue School, Los Angeles, California
- 1993 Host laboratory for summer student in NIH-funded Minority High School Student Research Apprenticeship Program, Modoupe Akinloye, (worked on histology cartilage project July-August 1993)

- 1994. Host laboratory and supervisor for Scientist-Teacher-Exchange-Program for local high school science teacher Sharron Mottsinger, July-August
- 1995 Host laboratory and supervisor for teacher Angela Ireland. NIH-funded "Precollege Research Opportunities for Minorities in Health Science Education", A. Harver, UNCC, P.I.
- 1995 Science Fair Judge, Holy Trinity Catholic Middle School, Charlotte, N.C. 12/9/95
- 2002 - Editorial Advisory Board Member, the journal Spine.
- 2002 - Editorial Board Member, Biotechnic & Histochemistry

## 8. **MEMBERSHIPS IN PROFESSIONAL AND SCIENTIFIC SOCIETIES**

American Association for the Advancement of Science  
 American Federation for Clinical Research  
 American Society for Bone and Mineral Research  
 American Society for Cell Biology  
 Society for Experimental Biology and Medicine  
 Society for Diagnostic Ultrastructural Pathology  
 Society for Quantitative Morphology  
 Electron Microscopy Society of America  
 Orthopaedic Research Society  
 International Society for Molecular Morphology  
 North American Spine Society

## 9. **ACADEMIC AND PROFESSIONAL APPOINTMENTS/COMMITTEES**

### A. **GRADUATE STUDENT COMMITTEE SERVICE**

Ar-tyan Hsu, Ph.D. completed August 1989; University of Southern California, Department of Physical Therapy; dissertation title: "Trabecular architecture and finite element analysis of the human calcaneus"

Kim O'Connor, Ph.D. completed December 1993; Department of Physical Therapy, University of Southern California; research on the effect of weight bearing on cartilage and joint function

Andrew Nelson, Ph.D. candidate; Department of Anthropology, University of California at Los Angeles; research in progress on morphology of bones of early primates

Carl Fisher, Jr. UNCC Dept. of Biology, master's candidate. Completed 8/5/96 "Effect of the insulin-like growth factors and bone morphogenetic protein on cell division and matrix production by human intervertebral disc cells". H. Gruber, advisor and research director.

Bhaloo Desai, Ph.D. Postdoctoral trainee with my laboratory 8/95 through 3/99. Studies on human disc cells in vitro.

Committee member for Bhavini Desai, Ph.D. candidate, Dept. of Biology, U.N.C. Charlotte, 1999 – present.

**B. EDITORIAL ACTIVITIES**

- 1986-1992 Editorial Board, Society for Experimental Biology and Medicine
- 1989-1993 Editorial Board, Quest - Science for Health, Cedars-Sinai Medical Center Research Institute Publication
- 1995-1997 Editorial Board, Journal of Dental Research
- 2002 - Editorial Advisory Board Member, the journal "Spine".
- 2002.- Editorial Board Member, "Biotechnic & Histochemistry".

**C. COMMITTEES**

- 1986-1993 Cedars-Sinai SSB Laboratory Committee
- 1987-1989 Cedars-Sinai Medical Center Research Committee
- 1988-1993 Cedars-Sinai Bioscience Library Task Force
- 1989-1993 Cedars-Sinai Medical Genetics Laboratory Quality of Service Committee
- 1990-1992 Co-chair, Fellowship Evaluation Program (Mentor Committees)
- 1990-1992 Chair, Medical Genetics Fellow's Journal Club
- 1991 Academic Consultant for Rhone-Poulenc Rorer, FDA Advisory Committee Meeting, July 23-24, 1991, Bethesda, Maryland
- 1992 Chair, Medical Genetics-Birth Defects Center 1991-92 Faculty Retreat, January 10, 1992
- 1992 Cedars-Sinai Medical Genetics Staff/Management Job Evaluation Committee
- 1992-1993 Associate Faculty, NIH Medical Genetics Intercampus Training Grant, UCLA
- 1992-1993 Strategic Planning Action Committee - Task Force on UCLA faculty retention
- 1998-99 Mentoring committee member for Mark Tenholder, M.D., Research Resident
- 1998-present Research Review Committee, Carolinas Medical Center
- 1999 "Cannon 2000: a working group of biomedical research faculty", May-June, 1999.
- 2000 Member, Education and Research and Carolinas HealthCare Foundation Advisory Committee for the 2000 United Way campaign.
- 2002 Institutional Animal Care and Use Committee, Carolinas Medical Center



**10. LECTURES AND PRESENTATIONS; INVITED PRESENTATIONS AND OTHERS 1994 - PRESENT**

"Cartilage: articular and epiphyseal", Orthopaedic Surgery Basic Science Conference, February 14, 1994

"Tendon and ligament", Orthopaedic Surgery Basic Science Conference, March 14, 1994

"Effects of low maternal calcium intake on the maternal and offspring skeleton", May 2, 1994, Calcium Group Noon Meeting, School of Dentistry, University of North Carolina at Chapel Hill.

"New developments in orthopaedic surgery", panel member, Orthopaedic Surgery Basic Science Conference, May 9, 1994.

"Research studies on human intervertebral disc cells", presented to the Dept. of Biology, University of North Carolina at Charlotte, Dec. 9, 1994.

"Bone and hormones", Orthopaedic Surgery Basic Science Conference, Apr. 17, 1995.

"Bone remodelling", Orthopaedic Surgery Basic Science Conference, May 15, 1995.

"Bone development and growth", Orthopaedic Surgery Basic Science Conference, June 12, 1995.

"Cartilage and disc", Orthopaedic Surgery Basic Science Conference, October 16, 1995.

"Inflammation and infection", Orthopaedic Surgery Basic Science Conference, Jan. 15, 1996.

"Skeletal embryology, growth and remodeling", August 19, 1996, Orthopaedic Surgery Basic Science Conference.

"Skeletal dysplasias", Sept. 16, 1996, Orthopaedic Surgery Basic Science Conference

Invited keynote speaker: "Perspectives on the skeletal dysplasias", N.C. Medical Genetics Assoc. Meeting, Dec. 5, 1997.

"Peripheral nerves", Jan 12, 1998, Orthopaedic Surgery Basic Science Conference

Coordinated Orthopaedic Surgery Basic Science Conference on the skeletal dysplasias, 9/21/98

"Tissue engineering for autologous disc cell therapy". Cannon Seminar Series, 9/9/98.

"Nerves", Orthopaedic Surgery Basic Science lecture, Jan 10, 2000

"Infection and inflammation", Orthopaedic Surgery Basic Science lecture, Feb. 14, 2000

"Basic features of bone cell function in health and disease. Invited platform presentation at Medfest 2000: Continuing Medical Education Conference for Primary Care Physicians and Specialists, Blacksburg, VA, May 5-6, 2000

Orthopaedic Surgery Basic Science Lecture: Jan. 14, 2002: Nerves

Orthopaedic Surgery Basic Science Lecture: Feb. 11, 2002: Inflammation and infection

Orthopaedic Surgery Basic Science Lecture: Oct 14, 2002, Osteoblasts and bone formation and osteoclasts and bone resorbing factors

Orthopaedic Surgery Basic Science Lecture: Nov 11, 2002, Osteoblasts and osteoclasts in metabolic bone disease.

Orthopaedic Surgery Basic Science Lecture: Dec. 9, 2002, The physis and physal fractures.

Orthopaedic Surgery Basic Science Lecture: Nov. 10, 2003: Cartilage and Disc

Orthopaedic Surgery Basic Science Lecture: Jan. 12, 2004: Peripheral Nerves.

Orthopaedic Surgery Basic Science Lecture: February 9, 2004: Inflammation and Infection

## **11. RESEARCH SUPPORT**

### **Funded:**

"Investigation of osteopenia and spontaneous fractures in an animal model", University of Southern California Faculty Research and Innovation Fund, \$11,000, 7/1/85-6/30/86

"The influence of low calcium intake on skeletal changes associated with pregnancy and lactation", National Dairy Council, \$32,680, 1/1/86-6/30/87

"Skeletal changes in offspring: Relation to maternal calcium intake and post-weaning diet", Cedars-Sinai Biomedical Research Support Grant, \$5,000, 9/1/86-8/31/87

"Purchase of a critical point dryer and sputter coater: Shared scanning electron microscopy support equipment for Pediatrics, Pathology and Nephrology", Cedars-Sinai Biomedical Research Support Grant, \$6,211, 2/87-3/88

"The skeletal dysplasias", National Institutes of Health (Co-Investigator), D. L. Rimoin, M.D., Ph.D., Principal Investigator, Years 4 and 5, 1989-1990 and 1990-1991

"Rescue and subsequent engraftment of osteogenic cells by bone marrow transplantation: Application to reversal of porcine cyclosporin or corticosteroid-induced osteopenia", Sandoz (Co-Investigator), F.R. Singer, M.D., Principal Investigator, Direct costs \$37,968, 10/1/91-9/29/92

"Assessment of the bone-forming activity of parathyroid hormone analogues", Loma Linda Veterans Association for Research and Education (Sub-contract), David Baylink, M.D. and Sandy Hilliker, Ph.D., Principal Investigators, \$6,750, 10/1/91-9/30/92

"The skeletal dysplasias", National Institutes of Health (Co-Investigator), D.L. Rimoin, M.D., Ph.D., Principal Investigator, Morphology Section, \$19,135, 5 year program project, 12/1/91-11/30/92

"Morphologic evaluation of effect of gallium on the rat osteoclast", (Principal Investigator), Fujisawa Pharmaceutical Co., \$20,000, 8/1/91-12/31/92

"Expanded histomorphometric characterization of bone biopsies from the Baylink/Chesnut calcimar osteoporosis study", (Principal Investigator), Rhone-Poulenc Rorer, \$25,000, 1/1/92-12/31/92

"Assessment of the bone-forming activity of parathyroid hormone analogues", Loma Linda Veterans Association for Research and Education (Sub-contract), David Baylink, M.D. and Sandy Hilliker, Ph.D., Principal Investigators, \$7,500, 3/15/92-3/14/93

"Polylactic acid foam efficacy in spinal fusion - a canine animal model", West Coast Spine Institute/UCLA (Sub-contract), Craig Callewart, M.D., Principal Investigator, Direct costs \$24,473, 7/1/92-12/31/93

"Rescue and subsequent engraftment of osteogenic cells by bone marrow transplantation: Application to reversal of porcine cyclosporin", Sandoz (Co-Investigator), F.R. Singer, M.D., Principal Investigator, Direct costs \$19,970, 11/1/92-4/30/93

"Studies in bone regeneration: Osteogenesis, osteoconduction, and osteoinduction", VAMC West Los Angeles (Sub-contract), T.A. Miller, M.D., Principal Investigator, Direct costs \$2,663, 8/1/92-1/31/94

"The skeletal dysplasias", National Institutes of Health Program Project (Co-Investigator), D.L. Rimoim, M.D., Ph.D., Principal Investigator, Morphology section - \$24,060, Year 7 of program project, 12/1/92-11/30/93

"The skeletal dysplasias", National Institutes of Health Program Project (Co-Investigator), D.L. Rimoim, M.D., Ph.D., Principal Investigator, Direct costs \$8,288, 12/01/93 - 11/30/94; \$8,619.

"Comparison of long term effects of surgical approaches to the acetabulum". O.B. Tabor, Jr., M.D., principal investigator; co-investigators: M.J. Bosse, M.D., J. F. Kellam, M.D., S. H. Sims, M.D., H. E. Gruber, Ph.D. Winkler Orthopaedic Research Fund. 11/28/94 - 5/27/95; \$32,548.

"Research histology studies", summer 1995. To support research for Mr. George Manousos, a year 3-4 PreMed student at UNC-Chapel Hill. \$3700., Charlotte-Mecklenburg Health Services Foundation, Inc.

"Summer studies in the nutrient modulation of disc cell function." To support summer 1995 research activities for Sharon McDaniel, a Queen's college senior who will continue research studies on disc cell culture. \$3700. Charlotte-Mecklenburg Health Services Foundation, Inc.

"Development of soft tissue bioprosthesis". W.D. Holder, Jr., M.D., G. Sonnenfeld, Ph.D., D. H. Hayes, M.D., B. Gordon, D.V.M., P. Watterson, M.D., H. Gruber, Ph.D. (20% effort, H. Gruber). direct costs, \$1,130,000 for 1994 - 1998. CMHA Health Services Foundation (Charlotte, N.C.) and Reprogenesis Corporation (Dallas, Tx).

"Morphologic and biomechanical joint studies in a patient with extensive rheumatoid arthritis". H.E. Gruber and R. Peindl. Smith Arthritis Foundation. 2/1/95 -12/31/96. \$1,950.

"Effect of the insulin-like growth factors and bone morphogenetic protein on cell division and matrix production by human intervertebral disc cells". Charlotte-Mecklenburg Health Services Foundation, Inc. H. E. Gruber. \$12,000. 7/1/95 - 6/30/96.

"Assessment of reamer system mechanical loads and resultant histopathology as factors affecting intramedullary pressurization". R. Peindl, M. Bosse, H. Gruber, et al. Orthopaedic Trauma Association. 11/95-10/96. \$18,365.

"*In situ* PCR hybridization: Detection of the expression of the small proteoglycans". H. E. Gruber and E. N. Hanley, Jr. Charlotte-Mecklenburg Health Services Foundation, Inc., summer 1996, \$3,700.

"Utilization of the sand rat for *in vivo* and *in vitro* studies of the intervertebral disc". H. E. Gruber and E. N. Hanley, Jr. Winkler Orthopaedic Fund, \$15,000, May 1, 1996 - April 30, 1997.

"Technician support for utilization of the sand rat for *in vivo* and *in vitro* studies of the intervertebral disc"; H. E. Gruber and E. N. Hanley, Jr., Charlotte Mecklenburg Health Services Foundation, 10/1/96 - 6/30/97, \$12,251.

"Summer support for a student to work on the project 'Utilization of the sand rat (*P. obesus*) for *in vivo* and *in vitro* studies of the intervertebral disc' ", H. E. Gruber and E. N. Hanley, Jr., summer 1997, \$3700

"Development of soft tissue bioprosthesis". W.D. Holder, Jr., M.D., G. Sonnenfeld, Ph.D., D. H. Hayes, M.D., B. Gordon, D.V.M., P. Watterson, M.D., H. Gruber, Ph.D. (20% effort, H. Gruber). \$526,000 extension through Dec. 1999. CMHA Health Services Foundation (Charlotte, N.C.) and Reprogenesis Corporation (Dallas, Tx).

"Cytosensor Microphysiometer equipment grant for studies of the human intervertebral disc cell in vitro", H. E. Gruber, Molecular Devices Corporation, \$29,750, 3/19/97

"Utilization of the sand rat for *in vivo* and *in vitro* studies of the intervertebral disc". H. E. Gruber and E. N. Hanley, Jr. Winkler Orthopaedic Fund, \$15,000, May 1, 1997 - April 30, 1998.

"Autologous disc cell transplantation in the sand rat (*Psammomys obesus*).", H.E. Gruber and E. N. Hanley, Jr.: (Graduate student project). Charlotte Mecklenburg Health Services Foundation, Inc. \$12,000 for one year. Funded on 6/17/97

"Characterization of sulfate metabolism and programmed cell death in human disc cells in vitro", H.E. Gruber, E. N. Hanley, Jr. and B. J. Desai. \$50,000, North American Spine Society; 1/1/98- 12/31/98

"Tissue engineering for autologous disc cell therapy in a small animal model." H. E. Gruber, and E. N. Hanley, Jr., \$95,000, National Medical Technology Testbed, 1 year beginning 11/15/97

"Programmed cell death and sulfate metabolism in cervical and lumbar human intervertebral discs". H.E. Gruber and E. N. Hanley, Jr. \$30,000, Cervical Spine Research Society. 1/1/98 - 12/31/98

"Implantation methodologies for autologous disc cell therapy". Alpha Omega Alpha Honor Medical Society - funded Student Research Fellowship for David Martin; Gruber lab is host lab; supply money: \$500 in addition to stipend to David. Summer, 1998

"Confocal microscope for the Cannon Research Center". \$250,000. N.C. Biotechnology Center. Awarded 6/15/98. C. Halberstadt, K. Burg, and H.E. Gruber

"Development of a bone cement implant for drug delivery". Fumio Tokita, W.K. Ramp, H.E. Gruber, R.D. Peindl: Charlotte-Mecklenburg Health Services Fdn., \$17,100. 7/1/98 - 6/30/99.

"Support of a breeding colony and adult colony of sand rats (*Psammomys obesus*) for studies of disc degeneration". H.E. Gruber. \$30,000. Charlotte-Mecklenburg Health Services Foundation. 9/1/98 - 8/31/00.

"Programmed cell death and sulfate metabolism in cervical and lumbar human intervertebral discs." H.E. Gruber and E. N. Hanley. The Cervical Spine Research Society. Year 2 competitive renewal. \$30,000 (which includes \$4,500 indirect costs). 1/1/99 - 12/31/99.

"Tissue engineering for autologous disc cell therapy in a small animal model." Year 2 competitive renewal. H.E. Gruber. National Medical Technology Testbed. \$86,786. (15% indirect costs) 4/22/99 - 4/21/00.

"Tissue engineering for the intervertebral disc with the sand rat model". H.E. Gruber and E.N. Hanley, North American Spine Society. 1/1/00 -12/31/00. \$42,830.

"Factors associated with physeal fracture healing and physeal bar formation", M. Wattenbarger, R. Meyer, H.E. Gruber, A. Marshall, Health Services Foundation, \$15,249. 9/1/00-8/31/01

"In vivo response to cross-linked polyethylene using a rat model". A. Marshall, H. Gruber, R. Meyer, T. Fehring. Winkler Orthopaedic Fellowship. \$16,982. 2001

"Human intervertebral disc cell attachment, proliferation and matrix production in vitro: Experimental studies with selected cell carriers for tissue engineering". H.E. Gruber, E.N. Hanley, Jr. North American Spine Society. 1/1/01 -12/31/01. \$50,000.

"Clinical, demographic and experimental characteristics of degenerative disc disease: A retrospective pilot study of patient and control data, disc histopathology and cell responsiveness". H.E. Gruber, D. Heiner, J. Patt, E.N. Hanley. \$45,000. Winkler Orthopaedic Research Fund. 2/11/02 – 12/31/03.

"Magnesium deficiency: Effect on bone and mineral metabolism". R. Rude, H.E. Gruber, B. Mills. NIH – Natl. Institute of Diabetes & Digestive & Kidney Diseases (Nutrient Metabolism Program). 2/1/02 – 1/31/05. Total grant amount: \$302,417.

Summer orthopaedic biology research intern, \$3,700. H.E. Gruber. Charlotte-Mecklenburg Health Services Foundation. 3/1/02-8/31/02

"Proposal for development of polymer rigid inorganic matrix material for orthopaedic trauma uses". J. Kellam, H.E. Gruber, R.A. Meyer, Jr. A.O. \$85,000. 6/1/02 – 12/31/04

"Does disc cell death increase as adjacent vertebral endplates undergo sclerosis?" H.E. Gruber and E.N. Hanley, Jr. A.O. \$30,000. 3/1/04-2/28/05.

## 12. Patents:

"Method for producing human intervertebral disc cells". E.N. Hanley, Jr., and H.E. Gruber. Patent No. 6,080,579. Issue date June 27, 2000.

## 13. BIBLIOGRAPHY

### A. SCIENTIFIC ARTICLES IN PRINT (REFEREED)

1. 1974      **Gruber, H.E.**, Rosario, B.: "Variation in eyespot ultrastructure in Chlamydomonas reinhardi (ac-31)." J. Cell Sci. 15:481-491
2. 1976      **Gruber, H.E.**, Nachtwey, D.S.: "Cell cycle dependent X-ray induced death in Chlamydomonas reinhardi." Radiat. Res. 66:288-302
3. 1976      **Gruber, H.E.**, Nachtwey, D.S.: "X-ray induced division delay in Chlamydomonas reinhardi." Radiat. Res. 66:303-309
4. 1977      **Gruber, H.E.**, Rosario, B.: "Ultrastructural variations in the flagellar apparatus of Chlamydomonas reinhardi (ac-31)." J. Submicrosc. Cytol. 9:103-113
5. 1978      **Gruber, H.E.**: "X-ray and proton-induced ultrastructural changes in dividing Chlamydomonas reinhardi." Radiat. Res. 73:137-159
6. 1978      Oberley, L.W., Bize, I., Sahu, S., Leuthauser, S., **Gruber, H.E.**: "Superoxide dismutase activity of normal murine liver, regenerating liver, and H6 hepatoma." J. Natl. Cancer Inst. 61:375-379
7. 1979      **Gruber, H.E.**, Rosario, B.: "Ultrastructure of the Golgi apparatus and contractile vacuole of Chlamydomonas reinhardi." Cytologia 44:505-526
8. 1979      **Gruber, H.E.**, Osborne, J.W.: "Ultrastructural features of hexamitiasis in X-irradiated rat small intestine." Lab. Anim. 13:199-202
9. 1980      Tewfik, H.H., **Gruber, H.E.**, Tewfik, F.A., Lifshitz, S.G.: "Intraperitoneal distribution of <sup>32</sup>P-chromic phosphate suspension in the dog." Int. J. Radiat. Oncol. Biol. Phys. 5:1907-1913

10. 1980 **Gruber, H.E.**, Tewfik, H.H., Tewfik, F.A.: "Cytoarchitecture of Ehrlich ascites carcinoma implanted in the hind limb of ascorbic-acid supplemented mice." Eur. J. Cancer **16**:441-448
11. 1980 **Gruber, H.E.**, Schedl, H., Osborne, J.W.: "Alterations in islet cell ultrastructure following streptozotocin-induced diabetes in the rat." Acta Diabetol. Lat. **17**:213-223
12. 1981 **Gruber, H.E.**, Stauffer, M., Thompson, E., Baylink, D.J.: "Diagnosis of bone disease by core biopsies." Semin. Hematol. **18**:258-278
13. 1981 **Gruber, H.E.**, Baylink, D.J.: "The diagnosis of osteoporosis." J. Am. Geriatr. Soc. **29**:490-497
14. 1982 Manzke, E., **Gruber, H.E.**, Hiness, R.W., Baylink, D.J.: "Skeletal remodelling and bone related hormones in two adults with increased bone mass." Metabolism **31**:25-32
15. 1982 Manzke, E., **Gruber, H.**, Hiness, R., Baylink, D.: "Osteopetrose: Unterschiedliche rontgenologische, morphologische, morphokinetische und biochemische Befunde bei zwei Erwachsenen mit Osteopetrose." Radiologe **22**:175-180
16. 1982 Manzke, E., **Gruber, H.**, Hiness, R., Baylink, D.: "Osteopetrose: Unterschiedliche rontgenologische, morphologische, morphokinetische und biochemische Befunde bei zwei Erwachsenen." Therapiewoche **32**:3630-3632
17. 1982 Liu, C., Rader, J., **Gruber, H.**, Baylink, D.: "Acute reduction in osteoclast number during bone repletion." Metab. Bone Dis. Relat. Res. **4**:201-209
18. 1982 **Gruber, H.E.**, Rosario, B., Hampton, J.C.: "Ultrastructural alterations following X-ray and proton irradiation of dividing *Chlamydomonas reinhardtii*." Scanning Electron Microsc. **1982**:323-333
19. 1983 Chesnut, C.H. III, Ivey, J.L., **Gruber, H.E.**, Matthews, M., Nelp, W., Sisom, K., Baylink, D.J.: "Stanozolol in postmenopausal osteoporosis: therapeutic efficacy, and possible mechanisms of action." Metabolism **32**:571-580
20. 1984 **Gruber, H.E.**, Ivey, J.L., Baylink, D.J., et al.: "Long-term calcitonin therapy in postmenopausal osteoporosis." Metabolism **33**:295-303
21. 1984 **Gruber, H.E.**, Gutteridge, D., Baylink, D.J.: "Osteoporosis associated with pregnancy and lactation: Bone biopsy and skeletal features in three patients." Metab. Bone Dis. Rel. Res. **5**:159-165
22. 1984 **Gruber, H.E.**, Brautbar, N.: "Metabolic bone disease and the elderly: current approach to diagnosis and therapy." Nephron **38**:76-86
23. 1984 **Gruber, H.E.**, Marshall, G.J., Kirchen, M.E., Brown, Wm., Kang, J.H., Massry, S.G.: "Quantitative bone histology of osteogenesis imperfecta: Comparison of types I and IV and identification of a low fibrosis subgroup." Orthopaedic Transactions **8**:290-291
24. 1984 Sweeney, J.R., Marshall, G.J., **Gruber, H.E.**, Kirchen, M.E.: "Effects of non-weight bearing on fracture healing." The Physiologist **27**(suppl.): S35-36

25. 1985      **Gruber, H.E.**, Marshall, G.J., Kirchen, M.E., et al.: "Improvements in dehydration and cement line staining for methacrylate-embedded human bone biopsies." Stain Technol. **60**:337-344
26. 1986      **Gruber, H.E.**, Ivey, J.L., Thompson, E.R., Chesnut, C.H. III, Baylink, D.J.: "Osteoblast and osteoclast cell number and cell activity in postmenopausal osteoporosis." Miner. Electrolyte Metab. **12**:246-254
27. 1986      Brautbar, N., **Gruber, H.E.**: "Magnesium and bone disease." Nephron **44**:1-7
28. 1987      **Gruber, H.E.**, Marshall, G.J., Moore, T.M., Schwinn, C.P., Kirchen, M.E., et al.: "Alteration in osteoblast cell number and cell activity in the presence of invading malignant fibrous histiocytoma." Cancer **59**:755-760
29. 1987      **Gruber, H.E.**, Singer, F.R.: "The spectrum of pathology in osteomalacia." Appl. Pathol. **5**:160-171
30. 1988      Greenberg, C.R., Rimoin, D.L., **Gruber, H.E.**, DeSa, D.J.B., Reed, M., Lachman, R.S.: "A new autosomal recessive lethal chondrodystrophy with congenital hydrops." Am. J. Med. Genet. **29**:623-632
31. 1988      **Gruber, H.E.**, Marshall, G.J., Nolasco, L.M., Kirchen, M.E., Rimoin, D.L.: "Alkaline and acid phosphatase demonstration in human bone and cartilage: Effects of fixation intervals and methacrylate embedments." Stain Technology **63**:299-306
32. 1989      **Gruber, H.E.**, Rimoin, D.L.: "Quantitative histology of cartilage cell columns in the human costochondral junction: Findings in newborn and pediatric subjects." Pediatr. Res. **25**:202-204
33. 1989      Shohat, M., Lachman, R., **Gruber, H.E.**, Rimoin, D.L.: "Brachyolmia: Radiographic and genetic evidence of heterogeneity." Am. J. Med. Genet. **33**:209-219
34. 1990      **Gruber, H.E.**, Greenberg, C., Lachman, R.S., Rimoin, D.L.: "Ultrastructural abnormalities in bone and calcifying cartilage in two siblings with a newly described recessive lethal chondrodysplasia." Ultrastruct. Pathol. **14**:343-355
35. 1990      Shohat, M., **Gruber, H.E.**, Pagon, R.A., Witcoff, L.J., Lachman, R., Ferry, D., Flaum, E., Rimoin, D.L.: "Geleophysic dysplasia: A storage disorder affecting the skin, bone, liver, heart and trachea." J. Pediatr. **117**:227-232
36. 1990      **Gruber, H.E.**, Lachman, R.S., Rimoin, D.L.: "Calcospherite size in the short rib polydactyly syndromes." Scanning Microsc. Int. **4**:775-780
37. 1990      Frydman, M., Bar-Ziv, J., Preminger-Shapiro, R., Brezner, A., Brand, N., Ben-Ami, T., Lachman, R.S., **Gruber, H.E.**, Rimoin, D.L.: "Possible heterogeneity in spondyloenchondrodysplasia: Quadriparesis, basal ganglia calcifications, and chondrocyte inclusions." Am. J. Med. Genet. **36**:279-284
38. 1990      **Gruber, H.E.**, Lachman, R.S., Rimoin, D.L.: "Quantitative histology of cartilage vascular canals in the human rib: Findings in normal neonates and children and in achondrogenesis II-hypochondrogenesis." J. Anat. **173**:69-75
39. 1991      **Gruber, H.E.**, Baylink, D.J.: "The effects of fluoride on bone." Clin. Orthop. **267**:264-277

40. 1991 **Gruber, H.E., Mekikian, P.:** "Application of Stains-all for demarcation of cement lines in methacrylate-embedded bone." Biotech. Histochem. 66:181-184
41. 1991 **Gruber, H.E.:** "Bone and the immune system." Proc. Soc. Exp. Bio. Med., 197:219-225
42. 1991 Marshall, G.J., Fras, I.A., Kirchen, M.E., O'Connor, K.M., **Gruber, H.E.**, Stover, S.J.: "Effects of microgravity vs gravity on fracture healing in the rat." Orthopaedic Transactions 15:404
43. 1991 Gold, M.E., Randzio, J., Kniha, H., Kim, B.S., Park, H.H., Stein, J.P., Booth, K., **Gruber, H.E.**, Furnas, D.W.: "Transplantation of vascularized composite mandibular allografts in young cynomolgus monkeys." Ann. Plast. Surg. 26:125-132
44. 1991 Shohat, M., Rimoin, D.L., **Gruber, H.E.**, Lachman, R.S.: "Perinatal lethal hypophosphatasia: Clinical, radiologic and morphologic findings." Pediatr. Radiol. 21:421-427
45. 1992 **Gruber, H.E.:** "Adaptations of Goldner's-Masson trichrome stain for the study of undecalcified plastic-embedded bone." Biotech. Histochem. 67:30-34
46. 1992 **Gruber, H.E.**, Baylink, D.J.: "Contributions of quantitative histomorphometry to the clinical evaluation of chondro-osseous tissue." Acta Stereologica 11(suppl. 1):711-716
47. 1992 Oldham, S.B., **Gruber, H.E.**, Rude, R.K.: "Lack of effect of ovariectomy on divalent cation regulation of skeletal adenylate cyclase." Osteoporosis Int. 2:174-179
48. 1992 **Gruber, H.E.**, Schwinn, C.P., Kirchen, M.E., Moore, T.M., Marshall, G.J.: "The bone response to invading tumors with spindle cell components: A report of findings in two patients." J. Lab. Clin. Med. 120:639-644
49. 1992 Bogaert, R., Tiller, G.E., Weis, M.A., **Gruber, H.E.**, Rimoin, D.L., Cohn, D.H., Eyre, D.R.: "An amino acid substitution (Gly<sub>853</sub> Glu) in the collagen 1 (II) chain produces hypochondrogenesis." J. Biol. Chem. 267:22522-22526
50. 1992 Peeden, J.N., Jr., Rimoin, D.L., Lachman, R.S., Dyer, M.L., Gerard, D., **Gruber, H.E.:** "Brief clinical report: Spondylometaphyseal dysplasia, Sedaghatian type." Am. J. Med. Genet. 44:651-656
51. 1993 Borochowitz, Z., Langer, L.O., Jr., **Gruber, H.E.**, Lachman, R., Katznelson, M. B-M., Rimoin, D.L.: "Spondylo-meta-epiphyseal dysplasia (SMED), short limb-hand type: A congenital familial skeletal dysplasia with distinctive features and histopathology." Am. J. Med. Genet. 45:320-326
52. 1993 Shohat, M., Lachman, R., **Gruber, H.E.**, Rimoin, D.L.: "A new epiphyseal stippling syndrome with osteoclastic hyperplasia." Am. J. Med. Genet. 45:558-561
53. 1993 **Gruber, H.E.:** "In vitro tetracycline labelling and bone cell survival in human trabecular bone explants." Bone 14(3):531-535
54. 1993 Rude, R.K., **Gruber, H.E.**, Oldham, S.B.: "Cortisone-induced osteoporosis: Effects on bone adenylate cyclase." Miner. Electrolyte Metab. 19:71-77



55. 1993 **Gruber, H.E.:** "Ultrastructural alterations and retention of the C-propeptide of type II collagen in human chondrocytes exposed to Brefeldin A." Bone 14:711-715
56. 1993 **Gruber, H.E.,** Marshall, G.J., Kirchen, M.E., Menendez, L.R., Schwinn, C.P.: "Bone remodelling in the presence of chondrosarcoma: Histomorphometry." Acta Anat. 148:1-7
57. 1994 **Gruber, H.E.,** Stover S.J. "Maternal and weanling bone: The influence of lowered calcium intake and maternal dietary history." Bone 15:167-176.
58. 1994 Rimoin, D.L, Rasmussen, I.M., Briggs, M.D., Roughley, P.J., **Gruber, H.E.,** et al.: "A large family with features of pseudoachondroplasia and multiple epiphyseal dysplasia: Exclusion of seven candidate gene loci that encode proteins of the cartilage extracellular matrix." Hum. Genet. 93:236-242.
59. 1994 Yamaguchi, D.T., Ma, D., Lee, A., **Gruber, H.:** "Isolation and characterization of gap junctions in the osteoblastic MC3T3-E1 cell line." J. Bone Miner. Res., 9:791-803.
60. 1994 Shohat, M., Lachman, R., **Gruber, H.E.,** et al.: "Desbuquois syndrome: Clinical, radiographic and morphologic characterization." Am. J. Med. Genet., 52:9-18.
61. 1994 **Gruber, H.E.:** "Perspectives on the endoplasmic reticulum as an 'architectural editor' with special reference to human chondrocytes and osteoblasts." Int. Rev. Exp. Pathol., 35:177-189.
62. 1994 **Gruber, H.E.,** Massry, S.G., Brautbar, N. "Effect of relatively long-term hypomagnesemia on the chondro-osseous features of the rat vertebrae". Mineral and Electrolyte Metabol., 20:282-286.
63. 1995 Ohta, T., Wergedal, J.E., **Gruber, H.E.,** Baylink, D.J., Lau, K.-H.W.: "Low dose phenytoin is an osteogenic agent in the rat." Calcif. Tiss. Int., 56:42-48.
64. 1995 Tiller, G.E., Weis, M.A., Polumbo, P.A., **Gruber, H.E.,** Rimoin, D.L., Cohn, D.H., Eyre, D.R.: An RNA-splicing mutation ( $G^{+5IVS20}$ ) in the type II collagen gene (COL2A1) in a family with spondyloepiphyseal dysplasia congenita. Am. J. Hum. Genet. 56:388-395.
65. 1995 **Gruber, H.E.,** Farley, S.M., Baylink, D.J.: Predictions on future diagnosis and treatment of osteoporosis: Results and discussion of a recent opinion poll. Calcified Tissue Internati., 57:83-85.
66. 1995 Kirchen, M.E., O'Connor, K.M., **Gruber, H.E.,** Sweeney, J.R., Fras, I.A., Stover, S.J., Sarmiento, A., Marshall, G.J.: Effects of microgravity on bone healing in a rat fibular osteotomy model. Clin. Orthopaedics and Related Research, 318:231-242.
67. 1995 **Gruber, H.E.,** Bleau, C.A., DuVarney, R.C.: Improved visualization of faint tetracycline bone labeling by image enhancement. Cell Vision - J. of Analytical Morphology 2:334-337.
68. 1995 **Gruber, H.E.** OsteoMeasure. Biotechnology Software Journal. 12(5): 30-31
69. 1996 Bergman, R.J., Gazit, D., Kahn, A.J., **Gruber, H.,** McDougall, S., and Hahn, T.J.: Age-related changes in osteogenic stem cells in mice. J. Bone Mineral Research 11(5):568-577.

70. 1996 Hilliker, S., Wergedal, J.E., **Gruber, H.E.**, Bettica, P., and Baylink, D.J.: Truncation of the amino terminus of PTH alters its anabolic activity on bone *in vivo*. Bone 19:469-477, 1996
71. 1996 **Gruber, H.E.**, Kirchen, M.E., Sweeney, J.R., Anderson, W.E., and Marshall, G.J.: Perturbations of periosteal bone during healing: Effect of non-weight bearing. Cells and Materials, 6:63-70.
72. 1997 **Gruber, H.E.**, Gonick, H.C., Khalil-Manesh, F., Sanchez, T.V., Motsinger, S., Meyer, M., and Sharp, C.F.: Osteopenia induced by long-term, low and high-level exposure of the adult rat to lead. Mineral and Electrolyte Metabolism, 23:65-73
73. 1997 **H. E. Gruber**, A. A. Stasky: Large specimen bone embedment and cement line staining: Notes on technique. Biotechnic and Histochemistry, 72:198-201.
74. 1997 Holder, W.D., **Gruber, H.E.**, Roland, W.D., Moore, A., Culberson, C., Loeb sack, A., Burg, K, and Mooney, D. Increased vascularization and heterogeneity of vascular structures occurring in polyglycolide matrices containing aortic endothelial cells implanted in the rat. Tissue Engineering 3:149-160, 1997
75. 1997 Kaysinger, K.K., Ramp, W.K., Lang, G.J., **Gruber, H.E.**: Comparison of human osteoblasts and osteogenic cells from heterotopic bone. Clinical Orthopaedics and Related Research, 342:181-191, 1997.
76. 1997 **Gruber, H.E.**, Fisher, E.C. Jr., Desai, B., Stasky, A.A., Hoelscher, G., and Hanley, E. N. Jr.: Human intervertebral disc cells from the annulus: Three-dimensional culture in agarose or alginate, and responsiveness to TGF- $\beta$ . Experimental Cell Research 235:13-21.
77. 1997 **Gruber, H.E.**, Stasky, A.A., and Hanley, E. N. Jr.: Characterization and phenotypic stability of human disc cells in vitro. Matrix Biology, 16:285-288.
78. 1998 Tabor, O.B., Bosse, M.J., Greene, K.G., **Gruber, H.E.**, Kaysinger, K.K., Sims, S.H., Blumenthal, S.D., Kellam, J.F.: Effects of surgical approaches for acetabular fractures with associated gluteal vascular injury. J. Orthop. Trauma, 12:78-84.
79. 1998 **Gruber, H.E.**, Hanley, E. N. Jr.: Analysis of aging and degeneration of the human intervertebral disc: Comparison of surgical specimens with "normal" controls. Spine, 23:751-757.
80. 1998 Holder, W.D., **Gruber, H.E.**, Moore, A.L., et al: Cellular ingrowth and thickness changes in polylactide and polyglycolide matrices implanted subcutaneously in the rat. J. Biomedical Materials Research, 41:412-421.
81. 1998 Rude, R.K., Kirchen, M., **Gruber, H.E.**, AA. Stasky, and M. H. Meyer: Magnesium deficiency induces bone loss in the rat. Mineral and Electrolyte Metabolism, 24:314-320.
82. 1999 **Gruber HE**, Norton HJ, Singer FR. In vivo morphologic changes in the rat osteoclast induced by gallium nitrate: The result of toxicity or other effects? Mineral and Electrolyte Metabolism. 25:127-134, 1999.
83. 1999 **Gruber, H.E.**, Ding, Y., Stasky, A., Meyer, M., Pandian, M., Pandian, D., Vaziri, N., Grigsby, J., Gonick, H.: Adequate dietary calcium mitigates osteopenia

induced by chronic lead exposure in adult rats. *Mineral and Electrolyte Metabolism*, 25:143-146.

84. 1999 Desai, B.J., **Gruber, H.E.**, Hanley, E.N. Jr.: The influence of matrigel or growth factor reduced matrigel on human intervertebral disc cell growth and proliferation. *Histology and Histopathology*, 14(2):359-368.
85. 1999 Desai, B.J. and **Gruber, H.E.**: Anti-apoptotic actions of cytokines in mammalian cells. A mini-review. *Proc. of the Society for Experimental Biology and Medicine*, 221:1-13.
86. 1999 David, S.M., **Gruber, H.E.**, Meyer, R.A. Jr., et al: Lumbar spinal fusion using recombinant human bone morphogenetic protein (rhBMP-2): A randomized, blinded and controlled study". *Spine* 24:1973-1979.
87. 1999 Meyer, R.A., **Gruber, H.E.**, Howard, B., Tabor, O., Murakami, T., Kwiatkowski, T., Wozney, J.: Safety of recombinant human bone morphogenetic protein-2 (rhBMP-2) following spinal laminectomy in the dog. *Spine*, 24:747-754, 1999
88. 1999 **Gruber, H.E.**, Coleman, S., Stasky, A., Hoelscher, G., and Desai, B.: Detection of apoptotic cells in vitro: A practical standardized experimental protocol using human fibroblasts for initial laboratory studies. *Biotechnic and Histochemistry*, 74:141-145, 1999
89. 1999 Gutteridge, D.H., **Gruber, H.E.**, Kermode, D.G., Worth, G.K.: Thirty cases of concurrent Paget's disease and primary hyperparathyroidism - sex distribution, histomorphometry and prediction of the skeletal response to parathyroidectomy. *Calcified Tissue International*, 65:427-435.
90. 1999 Rude, R.K., Kirchen, M.E., **Gruber, H.E.**, Meyer, M.H., Luck, J.S., Crawford, D.L.: Magnesium deficiency-induced osteoporosis in the rat: uncoupling of bone formation and bone resorption. *Magnesium Research* 12:257-267
91. 2000 **Gruber, H.E.**, Grigsby, J., Chesnut, C.H. III: Osteoblast numbers after calcitonin therapy: A retrospective study of paired biopsies obtained during long-term calcitonin therapy in postmenopausal osteoporosis. *Calcified Tissue International*, 66:29-34.
92. 2000 Hoelscher, G.L., **Gruber, H.E.**, Coldham, G., Grigsby, J.H., and Hanley, E.N. Jr.: Effects of very high antibiotic concentrations on human intervertebral disc cell proliferation, viability and metabolism in vitro. *Spine*, 25:1871-1877.
93. 2000 **Gruber, H.E.**, Norton, H.J., and Hanley, E.N. Jr.: Anti-apoptotic effects of IGF-1 and PDGF on human intervertebral disc cells in vitro. *Spine*. 25:2153-2157.
94. 2001 **Gruber, H.E.**, Ma, D., Ingram, J., Hanley, E.N. Jr., Yamaguchi, D.T.: Morphologic and molecular evidence for gap junctions and connexin 43 and 45 expression in annulus cells from the human intervertebral disc. *J. of Orthopaedic Research*, 19:985-989, 2001
95. 2000 **Gruber, H.E.**, Leslie, K.P., Ingram, J.A., and Hanley, E.N. Jr.: Optimization of 5-(and 6)-carboxyfluorescein diacetate succinimydyl ester (CFSE) for use in labelling human intervertebral disc cells. *Biotechnic and Histochemistry*, 75:118-123

96. 2000 Phieffer, L.S., Meyer, R.A. Jr., **Gruber, H.E.**, Easley, M., Wattenbarger, J.M.: Effect of interposed periosteum in an animal physeal fracture model. Clin. Orthopaedics and Related Research 376:15-25.
97. 2000 **Gruber, H.E.**, Hanley, E.N. Jr.: Human disc cells in monolayer vs 3D culture: cell shape, division and matrix formation. . BioMed Central, BMC Cell Biology, 2000, 2:3. <http://www.biomedcentral.com/1471-2121/2/3>
98. 2001 **Gruber, H.E.**, Ingram, J., Hanley, E.N. Jr.: Histopathologic features of pyrophosphate crystals in the disc: a case report with multi-level involvement. Spine, 26:E170-E174, April
99. 2001 **Gruber, H.E.**, Norton, H.J., Leslie, K., Hanley, E.N.: Clinical and demographic prognostic indicators for human disc cell proliferation in vitro. A pilot study. Spine, 26:2323-2327.
100. 2002 **Gruber, H.E.**, Johnson, T., H.J. Norton, E.N. Hanley, Jr.: The sand rat model for disc degeneration: Radiologic characterization of age-related changes. Cross-sectional and prospective analyses. Spine 27(3):230-234, 2002
101. 2001 **Gruber, H.E.**, Puzanov, I., Bennett, M., Kumar, V., Gordon, B. Alterations in osteoclast morphology following long-term 17- $\beta$ -estradiol administration in the mouse. BioMed Central, BMC Cell Biology, 2001, 2:3 <http://www.biomedcentral.com/1471-2121/2/3>
102. 2001 **Gruber, H.E.**, T.L. Johnson, J.M. Kinsella, E.C. Greiner, B.E. Gordon: Tapeworm identification in the laboratory fat sand rat. Contemporary Topics in Laboratory Animal Science. 40:22-24 (Nov.)
103. 2002 **Gruber, H.E.** and Hanley, E.N.: Ultrastructure of the human intervertebral disc during aging and degeneration: Comparison of surgical specimens with controls. Spine, 27:798-805.
104. 2002 **Gruber, H.E.**, Ingram, J., Hanley, E.N. Jr.: An improved staining method for intervertebral disc tissue. Biotechnique and Histochemistry, 77(2): 81-83, 2002.
105. 2002 **Gruber, H.E.**, Johnson, T.L., Leslie, K., Ingram, J.A., Martin, D., Hoelscher, G., Banks, D., Phieffer, L., Coldham, G., Hanley, E.N.: Autologous intervertebral disc cell implantation: A model using *Psammomys obesus*, the sand rat. Spine. 27(15):1626-1633.
106. 2002 **Gruber, HE**, Ingram, JA, and Hanley, EN Jr: Tenascin in the human intervertebral disc: Alterations with aging and disc degeneration. Biotechnique and Histochemistry, 77(1):37-41.
107. 2002 **Gruber, H.E.**, Yamaguchi, D., Ingram, J., Leslie, K., Huang, W., Miller, T., Hanley, E.N. Jr.: Expression and localization of estrogen receptor-beta in annulus cells of the human intervertebral disc and the mitogenic effect of 17-beta-estradiol. BioMedCentral Musculoskeletal Disorders 2002, 3:4. [www.biomedcentral.com/1471-2474/3/4](http://www.biomedcentral.com/1471-2474/3/4)
108. 2003 Rude, RK, **Gruber, HE**, B.G. Mills: Magnesium deficiency: Effect on bone and mineral metabolism in the mouse. Calcified Tissue International, 72:32-41.
109. 2002 **Gruber, HE**, Hanley, EN Jr: Observations on morphologic changes in the aging and degenerating human disc: Secondary collagen alterations. BioMed Central

Musculoskeletal Disorders. 3:9, 2002. <http://www.biomedcentral.com/1471-2474/3/9>

110. 2002 Wattenbarger, JM, **Gruber, HE**, Phieffer, LS: Physeal fractures, Part I: Histologic features of bone, cartilage and bar formation in a small animal model. *Journal of Pediatric Orthopaedics*, 22:703-709.
111. 2002 **Gruber, HE**, Phieffer, LS, Wattenbarger, JM: Physeal fractures, Part II: The fate of interposed periosteum in a physeal fracture. *Journal of Pediatric Orthopaedics*, 22:710-716.
112. 2003 **Gruber, H.E.** and E.N. Hanley, Jr.: Recent advances in disc cell biology. *Spine*, 28(2):186-193.
113. 2003 **Gruber, H.E.** and Gregg, J. Subchondral bone resorption in temporomandibular joint disorders. *Cells, Tissues, Organs*. Vol. 174, No. 1-2, pp 17 - 25 , 2003
114. 2003 **Gruber, H.E.**, Gordon, B., C. Williams, H.J. Norton, E.N. Hanley, Jr.: Bone mineral density of lumbar vertebral end plates in the aging sand rat spine. *Spine*, 28:1766-1772, 2003.
115. 2003 **Gruber, H.E.**, Ingram, J., Leslie, K., Norton, H.J., Hanley, E.N. Jr.: Cell shape and gene expression in human intervertebral disc cells: In vitro tissue engineering studies. *Biotechnic & Histochemistry*, 78(2): 109-117.
116. 2003 Wilson, C., Brown, D., Najarian, K., Hanley, E.N. Jr., **Gruber, H.E.**: Computer aided vertebral visualization and analysis: A pilot study using the sand rat, a small animal model of disc degeneration. *BioMed Central, Musculoskeletal Disorders*. 4:4, 2003. [www.biomedcentral.com/1471-2472/4/4](http://www.biomedcentral.com/1471-2472/4/4).
117. 2003 **Gruber, H.E.**, Rude, R.K., Wei, L., Frausto, A., Mills, B.G., Norton, H.J.: Magnesium deficiency: effect on bone mineral density in the mouse appendicular skeleton. *BioMed Central Musculoskeletal Disorders*. 4:7. [www.biomedcentral.com/1471-2474/4/7](http://www.biomedcentral.com/1471-2474/4/7).
118. 2004 **Gruber, H.E.**, Leslie, K., Ingram, J., Norton, H.J., Hanley, E.N. Jr.: Cell-based tissue engineering for the intervertebral disc: In vitro studies of human disc cell gene expression and matrix production within selected cell carriers. *The Spine Journal*, 4(1): 44-55, 2004.
119. 2004 Tenholder, M., Davids, J.R., **Gruber, H.E.**, Blackhurst, D.W.: Surgical management of juvenile amputation overgrowth with a synthetic cap. *J. of Pediatric Orthopaedics*, 24(2):218-226, March/April 2004.
120. 2003 **Gruber, H.E.** and Rude, R.K.: Alterations in osteoclast morphology following osteoprotegerin administration in the magnesium-deficient mouse. *Biotechnic & Histochemistry*, 78(5):231-236.
121. 2003 Marshburn, P.B., Meek, J.M., **Gruber, H.E.**, Gordon, B.E., Norton, H.J., and Hurst, B.S. Preoperative leuprolide acetate combined with Interceed optimally reduces uterine adhesions and fibrosis in a rabbit model. *Fertility and Sterility*, 81(1):194-197, 2004.
122. 2003 **Gruber, H.E.** and Hanley, E.N. Jr.: Current perspectives on novel biologic therapies for intervertebral disc degeneration. *Minerva Ortopedica e Traumatologica*, 54(4):297-303, 2003

123. 2003 **Gruber, H.E.**, and Hanley, E.N. Jr.: Biologic strategies for the therapy of intervertebral disc degeneration. *Expert Opinion on Biological Therapy*. 3 (8): 1209-1214, 2003. (December)
124. 2004 Rude, R.K., **Gruber, H.E.**, Norton, H.J., Wei, L.Y., Frausto, A., Mills, B.G.: Bone loss induced by dietary magnesium reduction to 10% of nutrient requirement in rats is associated with increased release of substance P and TNF-alpha. *Journal of Nutrition*, 13479-85, 2004.
125. 2004 **Gruber, H.E.**, Ingram, J., Hanley, E.N. Jr.: The SOX9 transcription factor in the human disc: Decreased immunolocalization with age and disc degeneration. *Spine*, in press.
126. 2004 **Gruber, H.E.**, Ingram, J.A., Leslie, K., Hanley, E.N. Jr.: Cellular, but not matrix, immunolocalization of SPARC in the human intervertebral disc: Decreasing localization with aging and disc degeneration. In press, *Spine*, 2004.
127. 2004 **Gruber, H.E.**, Leslie, K., Ingram, J., Hoelscher, G., Norton, HJ, Hanley, EN Jr.: Colony formation and matrix production by anulus cells: Modulation in three-dimensional culture. *Spine* 29(13):E267-E274, 2004.
128. 2004 **Gruber, H.E.**, Ingram, J, Norton, H.J., Wei, L.Y., Frausto, A., Mills, B.G., and Rude, R.K.: Alterations in growth plate and articular cartilage morphology are associated with reduced SOX9 localization in the magnesium-deficient rats. *Biotechnic & Histochemistry*, 79(1):45-52, 2004.

### C. BOOK CHAPTERS

- 1983 Brautbar, N., **Gruber, H.E.**, Lee, D.B.: "Disorders of calcium, phosphorous and magnesium." In: *Current Nephrology*, Vol. VII, H.C. Gonick, (Ed.), Wiley and Sons, 1983, pp. 371-487
- 1990 Lubin, M., **Gruber, H.E.**, Lachman, R., Rimoin, D.: "Skeletal abnormalities in the Turner syndrome." In: *Turner Syndrome*, R. Rosenfeld, M. Grumbach (Eds.), Marcel Dekker, Inc., New York, 1990, chapt. 23, pp. 281-300
- 1991 **Gruber, H.E.**, Greenberg, C., Lachman, R., Rimoin, D.L.: "Ultrastructural abnormalities in bone and calcifying cartilage in two siblings with a newly described recessive lethal chondrodysplasia." In: *Fundamentals of Bone Growth: Methodology and Applications*, A.D. Dixon, B.G. Sarnat, D.A. Hoyte (Eds.), CRC Press, Boca Raton, Florida, 1991, chapt. 35, pp. 347-361
- 1999 **H.E. Gruber** and A.A. Stasky. "Histological study in orthopaedic animal research." Chapt. 7 in: *Animal Models in Orthopaedic Research*, Y.H. An and R. J. Friedman, eds. CRC Press, Boca Raton, FL. pp 115-138, 1999.
- 2002 **H.E. Gruber**: Pathogenesis and histomorphology of osteoporosis. Chapter 1 in: *Internal Fixation in Osteoporotic Bone*. Y.H. An, editor. Thieme Medical, New York, 2002. pp 3-8
- 2003 Y.H. An, **H.E. Gruber**, W.L. Reis: Introduction to experimental bone and cartilage histology. Chapter 1 in: *Handbook of Histology Methods for Bone and Cartilage*, Y.H. An and K.L. Martin, eds. Humana Press, Totowa, N.J., pp 3-31.

- 2003 An, Y.H., Moreira, P.L., Kang, Q.K., **Gruber, H.E.**: Principles of embedding and common protocols. Chapter 11 in: : Handbook of Histology Methods for Bone and Cartilage, Y.H. An and K.L. Martin, eds. Humana Press, Totowa, N.J., pp 185-198.
- 2003 Kang, Q.K., LaBreck, J.C., **Gruber, H.E.**, An, Y.H. Histological techniques for decalcified bone and cartilage. Chapter 13 in: Handbook of Histology Methods for Bone and Cartilage, Y.H. An and K.L. Martin, eds. Humana Press, Totowa, N.J., pp 209-219.
- 2003 **H.E. Gruber** and **J.A. Ingram**: Basic staining and histochemical techniques and immunohistochemical localizations using bone sections. Chapter 20 in: Handbook of Histology Methods for Bone and Cartilage, Y.H. An and K.L. Martin, eds. Humana Press, Totowa, N.J., pp 281-286.
- 2003 003 **H.E. Gruber** and **J.A. Ingram**: Basic staining techniques for cartilage sections. Chapter 21 in: Handbook of Histology Methods for Bone and Cartilage, Y.H. An and K.L. Martin, eds. Humana Press, Totowa, N.J., 287-293.
- 2003 **H.E. Gruber** and W.W. Wiggins: Methods for transmission and scanning electron microscopy of bone and cartilage. Chapter 34 in: Handbook of Histology Methods for Bone and Cartilage, Y.H. An and K.L. Martin, eds. Humana Press, Totowa, N.J., pp 497-504.

#### D. SCIENTIFIC ARTICLES (NON-REFEREED)

- 1977 **Gruber, H.E.**, Osborne, J.W.: "Ultrastructural characteristics of advanced radiation-induced adenocarcinoma in the small intestine of the rat." Proceedings of the 14th Annual Electron Microscopy Colloquium, Ames, Iowa, USDOE Conf. 770504, pp. 16-20
- 1981 Chesnut, C.H. III, **Gruber, H.E.**: "Osteoporosis." In: Current Therapy, 1981, H.F. Conn (Ed.), W.B. Saunders Co., Philadelphia, Pennsylvania, pp. 485-488
- 1981 Ivey, J.L., **Gruber, H.E.**, Baylink, D.J.: "Measurement and significance of rates of osteoid maturation and mineral accumulation." In: Proceedings of the 3rd International Workshop on Bone Histomorphometry, W. Jee, A.M. Parfitt (Eds.), Societe Nouvelle de Publications Medicales et Dentaires, Paris, pp. 207-212
- 1981 Chesnut, C.H. III, Baylink, D.J., **Gruber, H.E.**, Ivey, J.L., et al.: "Treatment of postmenopausal osteoporosis with salmon calcitonin: Preliminary results." In: Osteoporosis: Recent Advances in Pathogenesis and Treatment, H. DeLuca, H. Frost, W. Jee, C. Johnston, A.M. Parfitt (Eds.), University Park Press, Baltimore, pp. 411-418
- 1981 Chesnut, C.H. III, Baylink, D.J., Roos, B.A., **Gruber, H.E.**, Ivey, J.L. et al.: "Calcitonin and postmenopausal osteoporosis." In: Calcitonin 1980: Chemistry, Physiology, Pharmacology and Clinical Aspects, A. Pecile (Ed.), Excerpta Medica, pp. 247-255
- 1982 Chesnut, C.H. III, **Gruber, H.E.**, Baylink D.J., et al.: "Treatment of postmenopausal osteoporosis with synthetic salmon calcitonin - An update." In: Osteoporosis: Proceedings of an International Symposium, Jerusalem, 1981, John Wiley and Sons, pp. 389-393
- 1982 Chesnut, C.H. III, **Gruber, H.E.**, Ivey, J.L., et al.: "Stanozolol, an anabolic steroid, in the treatment of postmenopausal osteoporosis - An update." In: Osteoporosis: Proceedings of an International Symposium, Jerusalem, 1981, John Wiley and Sons, pp. 385-388
- 1982 Baylink, D.J., Farley, J., Howard, G., Drivdahl, R., Puzas, E., Masuda, T., Ivey, J., **Gruber, H.**: "Coupling factor." In: Regulation of Phosphate and Mineral Metabolism, S. Massry, J.M. Letteri, E. Ritz (Eds.), Plenum Publishing Co., pp. 409-421

- 1983 Chesnut, C.H. III, **Gruber, H.E.**, Ivey, J.L., et al.: "Are synthetic salmon calcitonin and anabolic steroids efficacious in the treatment of osteoporosis?" In: Proceedings of an International Symposium: Osteoporosis - A Multi-Disciplinary Problem, London, The Royal Society of Medicine. Dixon, Stamp, Russell, Strattor (Eds.), Academic Press, pp. 239-244
- 1983 Chesnut, C.H. III, **Gruber, H.E.**, Ivey, J.L., et al.: "Synthetic salmon calcitonin in the treatment of postmenopausal osteoporosis." In: Proceedings of an International Workshop on Human Calcitonin, A. Caniggia (Ed.), Ciba-Geigy, Elli and Pagani-Milano, pp. 119-123
- 1983 Chesnut, C.H. III, Baylink, D.J., **Gruber, H.E.**, et al.: "Anabolic steroids, and calcitonin, in the treatment of postmenopausal osteoporosis." Proceedings of the Symposium on Clinical Disorders of Bone and Mineral Metabolism, Excerpta Medica, B. Frame (Ed.), pp. 355-359
- 1984 Gutteridge, D., Nicholson, G., **Gruber, H.E.**, et al.: "A case of severe high-remodelling idiopathic osteoporosis effectively treated with calcitonin." In: Osteoporosis, C. Christiansen, C. Arnaud, B. Nordin, A. Parfitt, W. Peck, L. Riggs (Eds.), Aalborg Stiftsbogtrykkeri, Denmark, pp. 531-533
- 1984 Gutteridge, D., Price, R., Nicholson, G., Kent, G., Retallack, R., Devlin, R., Worth, G., Glancy, J., Michel, P., **Gruber, H.E.**, "Fluoride in osteoporotic vertebral fractures - trabecular increase, vertebral protection, femoral fractures." In: Osteoporosis, C. Christiansen, C. Arnaud, B. Nordin, A. Parfitt, W. Peck, L. Riggs (Eds.), Aalborg Stiftsbogtrykkeri, Denmark, pp. 705-707
- 1983 Massry, S.G., **Gruber, H.**, Rizvi, A., et al.: "Use of 1,25(OH)<sub>2</sub>D<sub>3</sub> in the treatment of renal osteodystrophy in patients with moderate renal failure." Clinical Disorders of Bone and Mineral Metabolism, Proceedings of the Frances and Anthony D'Anna Memorial Symposium, Detroit, May, 1983, Excerpta Medica, pp. 260-262
- 1991 **Gruber, H.E.**: "Ultrastructural changes in the rough endoplasmic reticulum and its contents following Brefeldin A treatment of human chondrocytes in vitro." Proceedings of the 49th Annual Meeting of the Electron Microscopy Society of America, San Francisco Press, Inc., pp. 256-257
- 1997 Meyer, R.A., Jr., **Gruber, H.E.**, DeLuca, H.F., Binderup, L., and Meyer, M.H.: Treatment of X-linked hypophosphatemic (*Hyp*) mice with 24-homo-1,25-dihydroxyvitamin D<sub>3</sub> and KH 1060. In: Vitamin D: Chemistry, Biology and Clinical Applications of the Steroid Hormone. Proc. Tenth Workshop on Vitamin D. A. W. Norman, R. Bouillon, M. Thomass et, eds. Univ. of Calif., Riverside, pp 689-690.

## E. ABSTRACTS AND PRESENTATIONS

- 1973 **Gruber, H.E.**, Nachtwey, D.S.: "X-ray induced death and division delay in *Chlamydomonas reinhardtii*." Radiat. Res. 55:552-553
- 1973 **Gruber, H.E.**: "Variation in eyespot ultrastructure in *Chlamydomonas reinhardtii* (ac-31)." Northwest Section of the Society for Experimental Biology and Medicine, October, 1973, Vancouver, B.C.



- 1975 Brearly, A., Willis, D.L., **Gruber, H.E.**: "The effects of chronic immersion in Cesium-134 on the development of two frog species (Rana pretiosa and Hyla regilla).\" Presented at the Fourth National Symposium on Radioecology, May, 1975
- 1975 Willis, D.L., **Gruber, H.E.**: "The effect of temperature on the survival of irradiated newts (Taricha granulosa).\" Presented to the Health Physics Society, July, 1975
- 1976 **Gruber, H.E.**: "X-ray and proton induced ultrastructural changes in Chlamydomonas reinhardi.\" Radiat. Res. 67:565
- 1976 Willis, D.L., Valett, B., **Gruber, H.E.**: "The effect of temperature on the metabolism of radiocobalt in the rough-skinned newt (Taricha granulosa).\" Radiat. Res. 67:612
- 1978 **Gruber, H.E.**, Tewfik, H.: "Intraperitoneal distribution of colloidal  $^{32}\text{P}$  in the dog.\" Presented at the Northwest Section of the Society for Experimental Biology and Medicine, October, 1978.
- 1978 Oberley, L.W., Bize, I., Sahu, S., Leuthauser, S., **Gruber, H.**: "Superoxide dismutase activity of H6 hepatoma and regenerating liver.\" Radiat. Res. 74:542
- 1978 **Gruber, H.E.**, Schedl, H.P., Osborne, J.W.: "Alterations in islet cell ultrastructure following streptozotocin-induced diabetes in rats.\" J. Cell Biol., 79:191a
- 1981 **Gruber, H.E.**, Manzke, E., Baylink, D.J.: "Osteopetrosis: two types each with specific bone cell defects.\" Clin. Res. 29:54A
- 1981 Gutteridge, D.H., Price, R., Whitney, B., Doyle, F., Joplin, G., **Gruber, H.E.**, Baylink, D.J.: "Osteoporosis presenting after pregnancy or lactation - Clinical, radiological, bone density and bone biopsy data.\" Bone Structure, Function and Disease: Second International Symposium, Adelaide, Australia, March, 1981
- 1981 Ivey, J.L., **Gruber, H.E.**, Callahan, P.X., Baylink, D.J., Allen, P.E.: "Serum osteocalcin in normal, calcium depleted, and calcium repleting rats.\" 9th Annual Center-Sponsored Dental Research Conference, University of Washington, April, 1981
- 1981 **Gruber, H.E.**, Ivey, J.L., Baylink, D.J.: "Differential response in vertebrae and tibiae of rats on a low calcium diet.\" Calcif. Tissue Int. 33:293
- 1981 Gutteridge, D.H., **Gruber, H.E.**, Retallack, R.W., et al.: "Paget's disease with hyperparathyroidism - The Paget's response to parathyroidectomy.\" IVth European Symposium on Calcified Tissues, Belgium, September, 1981
- 1981 Manzke, E., **Gruber, H.**, Hiness, R., Baylink, D.: "Unterschiedliche rontgenologische, morphokinetische und biochemische Befunde bei zwei Erwachsenen mit Osteopetrose.\" XVIII Kongress der Sudwestdeutschen Gesellschaft fur Innere Medizin, Schwabisch Gmud, 10/1981.
- 1982 **Gruber, H.**, Ivey, J., Thompson, E., et al.: "Osteoblast and osteoclast cell number and cell activity in postmenopausal osteoporotics.\" Calcif. Tissue Int. 34:531
- 1984 **Gruber, H.E.**, Gutteridge, D., Baylink, D.J.: "Osteoporosis associated with pregnancy and lactation: Bone biopsy and skeletal features in three patients.\" Metab. Bone Dis. Rel. Res. 5:159-165
- 1983 Chesnut, C.H., Baylink, D.J., **Gruber, H.E.**, Ivey, J., Sisom, K.: "Anabolic steroids, and calcitonin in the treatment of postmenopausal osteoporosis.\" Clinical Disorders of Bone and Mineral Metabolism, Dearborn, Michigan, May 1983

- 1983 Manzke, E., Leupold, D., **Gruber, H.**, Baylink, D.: "Various types of skeletal remodeling in 3 patients with osteosclerosis." *Clinical Disorders of Bone and Mineral Metabolism*, Dearborn, Michigan, May 1983
- 1984 **Gruber, H.E.**, Marshall, G.J., Kirchen, M.E., et al.: "Quantitative bone histology of osteogenesis imperfecta: comparison of types I and IV and identification of a low fibrosis sub-group." Transactions of the 30th Annual Meeting of the Orthopaedic Research Society, February 1984, p. 213
- 1984 Sweeney, J., Marshall, G., **Gruber, H.E.**, et al.: "Effects of non-weight bearing on fracture healing." Transactions of the 30th Annual Meeting of the Orthopaedic Research Society, February 1984, p. 299
- 1984 Gutteridge, D.H., Nicholson, G.C., **Gruber, H.E.**, Michell, P., Kent, G.N., Price, R.I.: "A case of severe high-remodelling idiopathic osteoporosis effectively treated with calcitonin." *Proceedings of the Copenhagen International Symposium on Osteoporosis*, June, 1984
- 1984 Gutteridge, D.H., Price, R., Nicholson, G., Kent, G.N., Retallack, R.W., Devlin, R.D., Worth, G.K., Glancy, J.J., Michell, P., **Gruber, H.**: "Fluoride in osteoporotic vertebral fractures - trabecular increase, vertebral protection, femoral fractures." *Proceedings of the Copenhagen International Symposium on Osteoporosis*, June 1984
- 1984 **Gruber, H.E.**, Marshall, G.J., Kirchen, M., et al.: "Osteoblast cell number and cell activity are significantly altered by invading malignant fibrous histiocytoma." *J. Cell Biol.* **99**:426A
- 1984 Sweeney, J.R., Marshall, G.J., **Gruber, H.E.**, Kirchen, M.E.: "Effects of non-weight bearing on fracture healing." *NASA Proceedings of the Sixth Annual Meeting IUPS Commission of Gravitational Physiology*, 27, December 1984
- 1984 Sweeney, J.R., Marshall G.J., **Gruber, H.E.**, Kirchen, M.E.: "Effects of non-weight bearing on fracture healing." *The Physiologist* **27**, 6 Suppl.
- 1984 Sweeney, J.R., Marshall, G.J., **Gruber, H.E.**, Tarr, R.: "Effects of non-weight bearing on fracture healing." *Sixth Annual Meeting IUPS Commission on Gravitational Physiology*, Switzerland, 1984
- 1985 **Gruber, H.E.**, Marshall, G.J., Kirchen, M.E., Moore, T., Schwinn, P., Massry, S.G.: "Quantitative bone histomorphometry: A sensitive tool to study osteogenic sarcoma." Presented at the American Association for the Advancement of Science Annual Meeting, Los Angeles, May 29, 1985
- 1985 **Gruber, H.E.**, Sweeney, J.R., Kang, J., Marshall, G.J., Massry, S.G.: "Maternal and weanling bone response to low dietary calcium intake." Presented at the 7th Annual Meeting of the American Society for Bone and Mineral Research, June 1985
- 1985 Roe, C.J., Abrams, S.M.L., **Gruber, H.E.**, Baker, L.R.I.: "Controlled trial of 1,25-(OH)<sub>2</sub>D<sub>3</sub> in moderate chronic renal impairment." *7th International Workshop on Phosphate and Other Minerals*, Marseille, September 1985
- 1985 **Gruber, H.E.**, Brautbar, N.: "Osteoporosis, osteomalacia, hormones, calcemic agents and magnesium." *J. Am. Coll. Nutr.* **4**:329
- 1986 **Gruber, H.E.**, Marshall, G.J., Kirchen, M., Moore, T., Schwinn, C., Massry, S.: "Osteogenic sarcoma (OS): Evaluation with quantitative bone histomorphometry." Proceedings of the American Association for Cancer Research **27**:66 (abstract #260)

- 1986 **Gruber, H.E.**, Sweeney, J., Kirchen, M.E., Marshall, G.J.: "Non-weight bearing and delayed fracture healing; quantitative identification of defects in bone formation." J. Bone Miner. Res. 1 (Suppl. 1):105
- 1986 Gutteridge, D.G., **Gruber, H.E.**, Retallack, R.W., Worth, G.K.: "Concurrent Paget's disease and hyperparathyroidism - prediction of skeletal response to parathyroid surgery." J. Bone Miner. Res. 1 (Suppl. 1):225
- 1987 **Gruber, H.E.**, Nolasco, L., Rimoïn, D.L.: "Quantitation of cartilage cell columns in the human costochondral junction: Normal values and relationship to growth velocities." J. Bone Miner. Res. 2 (Suppl. 1), abstract #184
- 1987 **Gruber, H.E.**, Stover, S., Sharp, C., Marshall, G.J.: "Depletion of bone mineral content during lactation and repletion post-lactation: Events dependent on dietary calcium intake in the rat." J. Bone Miner. Res. 2 (Suppl. 1), abstract #361
- 1987 **Gruber, H.E.**, Marshall, G.J., Kirchen, M.E., Moore, T.M., Schwinn, C.P.: "Variability in bone response to invading tumors with spindle cell components." J. Cell Biol. 105 (4, part 2):292a
- 1988 **Gruber, H.E.**, Ivey, J.L., Chesnut, C.H. III, Baylink, D.J.: "Effect of tetracycline interlabel period on bone apposition rates in postmenopausal osteoporotic subjects." J. Bone Miner. Res. 3 (Suppl. 1): S158
- 1988 **Gruber, H.E.**, Lachman, R.S., Greenberg, S.R., Rimoïn, D.L.: "Lenz-Majewski syndrome: Evidence for abnormally high bone formation and defective coupling." J. Bone Miner. Res. 3 (Suppl. 1):S164
- 1988 **Gruber, H.E.**, Marshall, G.J., Kirchen, M.E., Schwinn, C.P.: "Altered bone remodelling in the presence of chondrosarcoma." J. Cell Biol. 107 (no. 6, part 3):162a
- 1988 Rimoïn, D.L., **Gruber, H.E.**: "Cartilage vascular canals: Incidence in normal human neonates and children and abnormalities in selected skeletal dysplasias." J. Cell Biol. 107 (no. 6, part 3):163a
- 1989 **Gruber, H.E.**, Lachman, R., Rimoïn, D.L.: "Ultrastructural abnormalities in bone and calcifying cartilage in the short rib polydactyly syndromes." J. Bone Miner. Res. 4 (Suppl. 1), p. 242, abstract #496
- 1989 **Gruber, H.E.**, Sharp, C.F., Rude, R.K., Ryzen, E., Adams, J.S., Singer, F.R.: "Efficacy of 1,25-(OH)<sub>2</sub>D<sub>3</sub> in treatment of adult acquired hypophosphatemic osteomalacia." J. Bone Miner. Res. 4 (Suppl. 1), p. s164, abstract #185
- 1989 Merritt, B., **Gruber, H.**, Kleeman, C.R., Yamaguchi, D.T.: "A new in vitro mineralization model in the osteosarcoma cell-line, UMR-106-01." J. Bone Miner. Res. 4 (Suppl. 1), p. s119, abstract #6
- 1990 **Gruber, H.E.**, Lachman, R., Rimoïn, D.L.: "Increased calcospherite size in calcifying cartilage in the short rib polydactyly syndromes." Invited abstract for Scanning Microscopy 1990 Meetings, May 5-10, 1990, Bethesda, Maryland
- 1990 **Gruber, H.E.**, Greenberg, C., Lachman, R., Rimoïn, D.L.: "Ultrastructural abnormalities in bone and calcifying cartilage in two siblings with a newly described recessive lethal chondrodysplasia." Presented at the Third International Conference on Fundamentals of Bone Growth: Methodology and Applications, Los Angeles, January 3-5, 1990

- 1990 Rude, R.K., **Gruber, H.E.**, Oldham, S.B.: "Cortisone induced osteoporosis is associated with an increase in specific activity of skeletal adenylate cyclase but not an increased response to PTH." J. Bone Miner. Res. 5 (Suppl. 2):S184, abstract #442
- 1990 **Gruber, H.E.**, Rimoin, D.L.: "Selective retention of molecules within the chondrocyte rough endoplasmic reticulum (rER): An ultrastructural marker for defective protein structure." J. Bone Miner. Res. 5 (Suppl. 2):S77, abstract #16
- 1990 Nolan, R.W., Rimoldi, R.L., **Gruber, H.E.**, Capen, D.A., Thomas, J.C.: "Bone quality and its relationship to tobacco use." International Congress of Orthopaedic Rehabilitation, Third International Symposium, June 23, 1990, Anaheim, California
- 1990 Lachman, R., **Gruber, H.E.**, Rimoin, D.L.: "Radiologic-pathologic correlation in hydrops - motheaten skeletal dysplasia: A new autosomal recessive lethal skeletal dysplasia." International Skeletal Society, Salzburg, Austria, September 1990
- 1990 Marshall, G.J., Fras, I.A., Kirchen, M.E., **Gruber, H.E.**, Sweeney, J.R., Stover, S.J.: "Effects of microgravity on aging in the house fly." American Society of Gravitational and Space Biology Bulletin 4(1):26
- 1991 Palank, W.J., **Gruber, H.E.**, Torabinejad, M.: "Quantitative histometric analysis of healing of periapical lesions in cats." 1991 Annual Session of the American Association of Endodontists, April 17-21, 1991, Washington, D.C.
- 1991 **Gruber, H.E.**: "Contributions of quantitative histomorphometry to the clinical evaluation of chondro-osseous tissue." Platform presentation, 8th International Congress for Stereology, University of California, Irvine, August 25-30, 1991
- 1991 **Gruber, H.E.**, Sharp, C.F., Jr., Stover, S.: "Densitometric evidence for a metabolic memory for mineral metabolism in the rat." J. Bone Miner. Res. 6 (Suppl. 1):S220
- 1991 **Gruber, H.E.**, Olvera, M.: "A human bone explant model for *in vitro* study of chronic exposure to basic fibroblast growth factor." J. Bone Miner. Res. 6 (Suppl. 1):S254
- 1991 **Gruber, H.E.**: "Ultrastructural changes in the rough endoplasmic reticulum and its contents following Brefeldin A treatment of human chondrocytes *in vitro*." Annual Meeting of the Electron Microscopy Society of America, San Jose, August 1991
- 1991 Peeden, J.N., Rimoin, D., Dyer, M., Gerard, D., Lachman, R.S., **Gruber, H.E.**: "Sedaghatian chondrodysplasia." Presented at: Southern Genetics Group Summer Meeting, XIV, July 11-13, 1991, Sandestin Beach Resort, Destin, Florida
- 1991 Morris, C.A., Lipshitz, J., Machette, J., Rimoin, D., **Gruber, H.**, Lachman, R.S.: "Siblings with a Russell-Silver like syndrome - prenatal diagnosis." Dave Smith Meeting, September 1991
- 1990 Rimoin, D., Cohn, D., Tiller, G., **Gruber, H.**, Murray, L., Eyre, D.: "Inborn errors of Co12A1 metabolism." Abstract #45, Am. J. Hum. Genet. 49(4):9 (Suppl.)
- 1991 Tiller, G.E., Bogaert, R., Eyre, D., **Gruber, H.E.**, Rimoin, D.L., Cohn, D.H.: "Substitution of glutamate for glycine 853 of the triple helical domain of type II collagen produces lethal spondyloepiphyseal dysplasia congenita (SEDC)." Abstract #522, Am. J. Hum. Genet. 49(4):107 (Suppl.)
- 1991 Cohn, D., Tiller, G., **Gruber, H.**, Rimoin, D., Bogaert, R., Eyre, D.: "Co12A1: Molecular and phenotypic correlations." Abstract #349, Am. J. Hum. Genet. 49(4):71 (Suppl.)

- 1992 **Gruber, H.E.:** "In vitro tetracycline labelling and bone cell survival in human trabecular bone explants." Presented at the 6th International Meeting of Bone Morphometry, 1992, Bone 13 (5):A12
- 1992 **Gruber, H.E.,** Sanchez, T.V., Khalil-Manesh, F., Gonick, H.E.: "Densitometric evidence for lead-induced osteopenia in the rat." J. Bone Miner. Res. 7(suppl 1):s174
- 1992 Yamaguchi, D.T., Ma, D., Lee, A., **Gruber, H.E.:** "Isolation and characterization of gap junctions in MC3T3-E1 osteoblastic cells." J. Bone Miner. Res. 7(suppl 1):s125
- 1992 Rimoldi, R.L., Capen, D.A., Nelson, R.W., Nagelberg, S., Thomas J.C., Jr., **Gruber, H.E.,** et al.: "Bone quality and its relationship to tobacco use." 86th Annual Meeting of the Southern Medical Association, San Antonio, November 12, 1992
- 1992 Mullen, B.J., Chitayat, D., Pauzner, D., Lachman, R.L., **Gruber, H.E.,** Rimoin, D.L.: "Hydrops-ectopic calcification-moth-eaten skeletal dysplasia (HEM), (Greenberg Dysplasia): Prenatal diagnosis and further delineation." Am. J. Hum. Genet. 51(4) (Suppl.):A32
- 1993 Rimoldi, R.L., Capen, D.A., **Gruber, H.,** Nagelberg, S., Nelson, R.W., Nolen, R., Thomas, J.C., Jr.: "Bone quality and its relationship to tobacco use." Presented at the Annual Meeting of the American Academy of Orthopaedic Surgeons in San Francisco, February 22, 1993
- 1993 Levis, S., **Gruber, H.E.,** Cohn, D., Howard, G.A., Roos, B.A.: "Juvenile osteoporosis treated with palmidronate." Calcif. Tissue Int. 52 (Suppl. #2):S41
- 1993 Wilkin, D.J., Weis, M.A., **Gruber, H.E.,** et al.: "An exon-skipping mutation in the type II collagen gene (Co12A1) produces Kniest dysplasia." Am. J. Hum. Genet. 53(3) (Suppl.):208
- 1994 **Gruber, H.E.,** Bleau, C.A., DuVarney, R.C.: Improved visualization of faint tetracycline bone labelling via image enhancement. J. Bone Mineral Res. 9 (suppl. 1): s293.
- 1994 **Gruber, H.E.,** Singer, F.R.: Morphologic evaluation of the effect of gallium on the rat osteoclast. J. Bone Mineral Res. 9 (suppl. 1): s179.
- 1995 O'Connor, K.M., **Gruber, H.E.,** Marshall, G.J.: Articular cartilage adaptation to unweighting with and without cast immobilization. Trans. 41st annual meeting, Orthopaedic Research Society, 20:514.
- 1995 David, S.M., **Gruber, H.E.,** Gravitte, K.D., Meyer, R.A. Jr., Ramp, W.K., Hanley, E.N. Jr.: Intervertebral disc transplantation: a canine study. Trans. 41st annual meeting, Orthopaedic Research Society, 20:300.
- 1995 **Gruber, H.E.,** Loeb, T.A., Sikking, E.: Long term expression of the human osteoblast phenotype in vitro is enhanced by a fibronectin substrate. Poster presentation, Nov. 1995, Transactions of the 2nd Combined Meeting of the Orthopaedic Research Societies, p. 288.
- 1995 **Gruber, H.E.,** Loeb, T.A., Stasky, A., Tabor, O., David S., McDaniel, S., E.N. Hanley, Jr.: Human intervertebral disc cells: *in vitro* responsiveness and *in situ* apoptosis and cell proliferation. Platform presentation, Nov. 1995, Transactions of the 2nd Combined Meeting of the Orthopaedic Research Societies, p. 34.
- 1995 David, S.M., Murakami, T., Tabor, O., Meyer, R., Howard, B., **Gruber, H.E.,** Hanley, E.N. Jr.: Lumbar spinal fusion using recombinant human bone morphogenetic protein (rhBMP-

- 2): A randomized, blinded controlled study. Poster presentation, Nov. 1995, Transactions of the 2nd Combined Meeting of the Orthopaedic Research Societies, p. 295.
- 1995 **Gruber, H.E.**, Loeb, T.A., Stasky, A., McDaniel, S., Hanley, E. N. Jr.: The diseased human intervertebral disc: In vitro and morphologic characterization. J. Bone Mineral Res. 10 (Suppl. 1): p. S229, 1995.
- 1995 Hilliker, S., **Gruber, H.E.**, Wergedal, J.E., Bettica, P., and Baylink, D.J.: Anabolic activity of truncated forms of PTH *in vivo* and *in vitro*. J. Bone Mineral Res. 10 (Suppl. 1): p. S276, 1995.
- 1995 Baylink, T., Mohan, S., **Gruber, H.**, Beamer, W., Donahue, L., Lee, J.E.S. and Baylink, D. Evidence that BMP-5 functions to stimulate epiphyseal and periosteal bone formation and endosteal resorption: Studies of the short ear mouse, a BMP-5 mutant. J. Bone Mineral Res. 10 (Suppl. 1): p. S336, 1995.
- 1995 Ireland, A.C., Loeb, T., **Gruber, H.E.**, McDaniel, S.E.: Effect of growth factors on [<sup>3</sup>H] thymidine incorporation in disc cells grown in alginate. Presented at the first annual symposium for Precollege Research Opportunities for Minorities in Health Science Education (Project PROMISE), Univ. N. C. at Charlotte, August 11, 1995.
- 1995 Holder, W.D.Jr., **Gruber, H.E.**, Moore, A.L., et al: Cellular ingrowth into poly(L-lactic) acid and poly(glycolic) acid matrices in the rat. Jan. 1996 Keystone Symposia.
- 1996 David, S.M., **Gruber, H.E.**, Murakami, T., Tabor, O.B., Meyer, R.A. Jr., Howard, B.A. and Hanley, E.N. Jr.: Lumbar spinal fusion using recombinant human bone morphogenetic protein (rhBMP-2): A randomized, blinded and controlled study. Transactions of the 42nd annual meeting, Orthopaedic Research Society, vol 21, section 1, p. 119-20, 1996.
- 1996 **Gruber, H.E.**, Khalil-Manesh, F., Sanchez, T.V., Meyer, M.H., and Gonick, H.C. Osteopenia induced by long-term low and high-level exposure of the adult rat to lead. Proc. Ninth International Symposium on Trace Elements in Man and Animals, 1996: 78.
- 1996 **Gruber, H.E.**, Kirchen, M.E., Sweeney, J.R., Marshall, G.J. Perturbations of periosteal bone during healing: Effect of non-weight bearing. Platform talk, Scanning Microscopy International, Bethesda, May, 1996.
- 1996 **Gruber, H.E.**, Hanley, E.N. Jr.: Younger may not be better: Disc cell responsiveness *in vitro*. Poster presented at the 109th annual meeting of the American Orthopaedic Association, Colorado Springs, June 8-11.
- 1996 Baylink, D.J., Donahue, L., Rosen, C.J., **Gruber, H.**, Lee, J.E.S., Farley, J., Beamer, W.: Novel genetic model of peak bone density: A polygenic trait. 10th International Congress of Endocrinology, June 12-15, 1996. Proceedings: p. 371, #P1-945.
- 1996 **Gruber, H.E.**, Desai, B.J., Loeb, T.A., Fisher, E. C. Jr., and Hanley, E. N. Jr.: Decorin and biglycan gene expression and cell proliferation in human disc cells *in vitro*: Differential effects of TGF- $\beta$ 1. Mol. Biol. of the Cell vol. 7, suppl., p 413a
- 1996 Desai, B.J., **Gruber, H.E.**, Hanley, E. N. Jr.: Matrigel enhances cell proliferation, but not CFU formation in human intervertebral disc cells. Mol. Biol. of the Cell, vol. 7, suppl., p 420a.
- 1996 **Gruber, H.E.**, Desai, B., Loeb, T.A., Fisher, C., Hanley, E.N. Jr.: Transforming growth factor- $\beta$ 1 (TGF- $\beta$ ) regulates proliferation and proteoglycan gene expression in diseased human intervertebral disc cells. J. Bone Mineral Res: 11 (suppl. 1): s300, 1996.

- 1996 Rude, R.K., Kirchen, M.E., **Gruber, H.E.**, Meyer, M.H.: Magnesium deficiency induces osteoporosis in the rat. J. Bone Mineral Res: 11 (suppl. 1): s326, 1996.
- 1996 Linkhart, T., Farley, J., Dimai, H.P., Beamer, W., Donahue, L.R., Rosen, C., **Gruber, H.**, Baylink, D.J.: Genetic model of murine peak bone density: strain specific differences in peak bone density, osteoclast number, and interleukin-6 production. J. Bone Mineral Res: 11 (suppl. 1): s146, 1996.
- 1997 Kwiatkowski, T.C., Meyer, R.A. Jr., **Gruber, H.E.**, Tabor, O.B. Jr., Murakami, T., Howard, B.A., Wozney, J.M., Hanley, E.N. Jr.: Spinal laminectomy with recombinant human bone morphogenetic protein (rhBMP-2) in the canine: A safety study. Trans. 43rd annual meeting of the Orthopaedic Research Society, vol 22: 189.
- 1997 Meyer, R.A., Jr., **Gruber, H.E.**, DeLuca, H.F., Binderup, L., and Meyer, M.H.: Treatment of X-linked hypophosphatemic (*Hyp*) mice with 24-homo-1,25-dihydroxyvitamin D<sub>3</sub> and KH 1060. Vitamin D Workshop, Proceedings, in press
- 1997 Burg, K.J.L., Holder, W.D. Jr., **Gruber, H.E.**, et al: The influence of tissue processing protocol on the analysis of polylactide sponges. Transactions, 23rd Annual Meeting of the Society for Biomaterials, Apr. 30-May 4.
- 1997 **Gruber, H.E.**, Desai, B., Stasky, A.A., Hoelscher, G., Crawford, D., Hanley, E. N. Jr.: Characterization and phenotypic stability of human disc cells in vitro. J Bone Mineral Res 12 (suppl. 1): S298
- 1997 Desai, B.J., **Gruber, H.E.**, Stasky, A.A., Swiggett, J.P., Hanley, E.N. Jr.: Programmed cell death in human intervertebral disc cells: High in vivo incidence and in vitro correction by IGF-I exposure. J Bone Mineral Res 12 (suppl. 1): S206.
- 1997 Rude, R.K., Kirchen, M., **Gruber, H.E.**, Meyer, M.H., Crawford, D.L.: Magnesium deficiency alters bone and mineral homeostasis in the rat. J Bone Mineral Res 12 (suppl. 1): S226.
- 1997 Pfeiffer, L., Wattenbarger, J.M., **Gruber, H.**, Meyer, R., Easley, M.: The effect of interposed periosteum on a physeal fracture in an animal model. Oscar Miller Day, Charlotte, N.C., Oct. 31, 1997.
- 1997 Banks, D., **Gruber, H.**, Martin, D. et al: Vertebral disc cell extraction and culture using a small animal model: A feasibility study. Southern Medical Association, poster for Nov. meeting
- 1998 Pfeiffer, L.S., Wattenbarger, M., Meyer, R., **Gruber, H.**, Easley, M.: Effect of interposed periosteum in an animal physeal fracture model. Residents' Day Research Presentations, Dept. of Orthopaedic Surgery, May 15, 1998.
- 1998 **Gruber, H.E.**, Hoelscher, G., Desai, B., Hanley, E.N. Jr.: Human intervertebral disc cells in three-dimensional culture. Poster presentation at the First Southeastern US Tissue Engineering Conference, June 5, Research Triangle Park, N.C.
- 1998 **Gruber, H.E.**, Hanley, E.N. Jr.: Ultrastructural characteristics of cells and extracellular matrix of the human intervertebral disc during aging and degeneration: comparison of surgical specimens with controls. Platform presentation, Ultrapath IX, Asheville, Aug, 1998.
- 1998 Loebbeck, A.B., Halberstadt, C.R., Holder, W.D. Jr., **Gruber, H.E.**, Culberson, C.R., Greene, K.G., Roland, W.D., Burg, K.J.L.: The development of an embedding technique

- for polylactide sponges. Platform presentation, annual 1998 meeting of the Society for Biomaterials.
- 1998 **Gruber, H.E.**, Fisher, E.C. Jr., Hoelscher, G., Hanley, E. N. Jr.: Disc degeneration and aging: morphologic changes correlate with poor proliferative responses to IGF-1 by human cells grown in vitro in agarose culture. Orthopaedic Research Society, 44th annual meeting, poster, 3/17/98.
- 1998 Phieffer, L.S., Wattenbarger, M., Meyer, R., **Gruber, H.**, Easley, M.: Effect of interposed periosteum in an animal physeal fracture model. Residents' Day Research Presentations, Dept. of Orthopaedic Surgery, May 15, 1998.
- 1998 Gutteridge, D.H., **Gruber, H.E.**, Kermode, D.G., Worth, G.K.: Paget's disease with primary hyperparathyroidism - sex distribution in 30 cases; prediction of skeletal response to parathyroidectomy in 18. National Association for the Relief of Paget's Disease, International Symposium, Oxford, 7/98.
- 1998 **Gruber, H.E.**, Hoelscher, G.L., Grigsby, J., G. Coldham, Hanley, E.N. Jr.: Toxic effects of antibiotics on human disc cells in vitro. North American Spine Society, Oct. 1998 meeting. Platform presentation.
- 1998 Phieffer, L.S., Wattenbarger, J.M., Meyer, R.A., **Gruber, H.E.**, Easley, M.: Effect of interposed periosteum on a physeal fracture in an animal model. Orthopaedic Trauma Association, Oct. 1998. Platform presentation
- 1998 Phieffer, L.S., Wattenbarger, J.M., Meyer, R.A., **Gruber, H.E.**, Easley, M.: Physeal fracture with interposed periosteum: Bone growth and histology in an animal model. Amer. Acad. Orthopaedic Surgeons, Feb., 1999.
- 1998 **Gruber, H.E.**, Puzanov, I., Bennett, M., Kumar, V., Gordon, B.: Ablation of natural killer 1.1 cells blocks osteoclastic resorption in vivo. J. Bone Mineral Res. 23(5) (suppl), #T111, p. S229, 1998.
- 1999 **Gruber, H.E.**, Hanley, E.N.: Human intervertebral disc cells: Differences in collagen and proteoglycan production in monolayer vs three-dimensional culture. 45th annual meeting of the Orthopaedic Research Society, Feb., 1999. Poster presentation. Trans. O.R.S., p 1034.
- 1999 Phieffer, L.S., Meyer, R.A. Jr., **Gruber, H.E.**, Easley, M.: Effect of interposed periosteum on a physeal fracture: Bone growth and histology in an animal model. 45th annual meeting of the Orthopaedic Research Society, Feb., 1999, poster presentation.
- 1999 Phieffer, L.S., Wattenbarger, J.M., Meyer, R.A. Jr., **Gruber, H.E.**, Easley, M.: Effect of interposed periosteum on a physeal fracture: Bone growth and histology in an animal model. Trans. Orthoped. Res. Society 24:691
- 1999 **H.E. Gruber**, E.N. Hanley: Human intervertebral disc cells: Differences in collagen and proteoglycan production in monolayer vs three-dimensional culture. , Jr. July 10, 1999. The Third North Carolina Tissue Engineering Group Meeting, Charlotte, N.C.
- 1999 Gutteridge, D.H., **Gruber, H.E.**, Kermode, D.G., Worth, G.K.: Paget's disease with primary hyperparathyroidism: Gender distribution in 30 cases, and prediction of skeletal response to parathyroidectomy in 18. Bone. 24 (no. 5, suppl): 51S.
- 1999 G. Coldham, E.N. Hanley, **H. Gruber**, K. Leslie. The effect of chondroitin sulphate on cultured human disc cells. CMC Dept. of Orthopaedic Surgery Annual Resident's Visiting Professor Program, May 13, 1999.



- 1999 J. Meek, **H.E. Gruber**, B.E. Gordon, P.B. Marshburn. The effect of GnRH analogue pretreatment along with oxidized regenerated cellulose (Interceed) upon post-surgical adhesion formation in the rabbit. Spring Symposium, CMC, May, 1999
- 1999 **Gruber, H.E.**, Coleman, S.S., Hanley, E.N.Jr. Anti-apoptotic effects of cytokines on human intervertebral disc cells in vitro. Poster presentation, International Society for the Study of the Lumbar Spine, Hawaii, June 21-25, 1999.
- 1999 **Gruber, H.E.**, Hanley, E.N. Jr.: Rescue of human disc cells from apoptosis. Platform presentation, Cervical Spine Research Society, December, 1999, Seattle
- 1999 **Gruber, H.E.**, Coleman, S.S., Hanley, E.N.Jr.: In vitro rescue of human disc cells from apoptosis. Platform presentation, North American Spine Society, Oct., 1999, Chicago
- 2000 **H.E. Gruber** and E.N. Hanley. Heterogeneity in 35-S-uptake by human intervertebral disc cells in vitro. Platform presentation, Internatl. Soc. for the Study of the Lumbar Spine, April 2000 meeting.
- 2000 **H.E. Gruber** and E.N. Hanley. In vitro rescue of human disc cells from apoptosis by IGF-1 and PDGF. Poster presentation, ORS, March, 2000.
- 2000 **H.E. Gruber** and J.A. Ingram: Invited speaker at the North Carolina Society of Histopathology Technologists, March 31, 2000: Practical approaches to bone and cartilage histology
- 2000 J. Meek, **H. Gruber**, B. Gordon, P. Marshburn: The effect of GnRH analogue pretreatment along with oxidized regenerated cellulose (Interceed) upon post-surgical adhesion formation in the rabbit. Platform presentation at the 26<sup>th</sup> Scientific Meeting of the Society of Gynecologic Surgeons, Feb. 29, 2000, New Orleans.
- 2000 **H.E. Gruber**, S. Coleman, E.N. Hanley, Jr.: Anti-apoptotic effects of cytokines on human intervertebral disc cells in vitro. Poster presentation at the April 7, 2000 N.C. Tissue Engineering Interest Group meeting. Research Triangle Park.
- 2000 **H.E. Gruber**, E.N. Hanley, Jr.: Selective in vitro attachment patterns are used by human disc cells from the annulus in response to different culture microenvironments. Platform presentation, Cervical Spine Research Society, 11/30/2000, Charleston, S.C.
- 2001 **H.E. Gruber** and E.N. Hanley, Jr.: Cell shape modulates differential proliferative potentials in human intervertebral disc cells in vitro. Poster presentation, Amer. Acad. Orthopaedic Surgeons, 68<sup>th</sup> annual meeting, San Francisco, Feb 28-Mar 4, 2001
- 2001 JM Wattenbarger, L. Phieffer, **H. Gruber**: Histologic features of physeal bar formation in physeal fractures. POSNA, May, 2001 meeting. Received Best Poster award.
- 2001 J.M. Wattenbarger, L. Phieffer, **H. Gruber**: Histologic features of physeal bar formation in physeal fractures. Growth Plate Conference, June, 2001.
- 2001 J.M. Wattenbarger, L. Phieffer, R.Meyer, **H.E. Gruber**: Histologic features of physeal bar formation in physeal fractures. Podium presentation, Amer. Acad. Orthopaedic Surgeons, 68<sup>th</sup> annual meeting, San Francisco, Feb 28-Mar 4, 2001
- 2001 **Gruber, H.E.**, Leslie, K.P., Johnson, T.L., Ingram, J.A., Phieffer, L., Banks, D., Hanley, E.N.Jr. Autologous disc cell implantation in a small animal model. North American Spine Society 16<sup>th</sup> annual meeting, Seattle, poster presentation, 10/31/01.

- 2001 Rude, R.K., **Gruber, H.E.**, Wei, L., Frausto, A., Mills, B. Magnesium deficiency: Effect on bone and mineral metabolism in the mouse. Poster presentation at the annual meeting of the Amer. Soc. For Bone and Mineral Research. J. Bone Mineral Res. 16, suppl. 1, abstract SA312, p S278, 2001.
- 2001 Gruber, H.E. and Hanley, E.N. Jr.: Autologous disc cell implantation in a small animal model. 95<sup>th</sup> annual meeting, Interurban Orthopaedic Society, Oct. 5-6, Charlotte.
- 2001 **Gruber, H.E.**, Ingram, J., Hanley, E.N.: Tenascin in the human intervertebral disc: Alterations with aging and disc degeneration. Cervical Spine Research Society 29<sup>th</sup> annual meeting, Monterey, CA Nov 29-Dec 1, 2001. Poster presentation. Received 1<sup>st</sup> place as Basic Science Poster.
- 2002 JM Wattenbarger, L. Phieffer, **H. Gruber**: Histologic features of physeal bar formation physeal fractures. Amer. Acad. Orthopaedic Surgeons, poster presentation, 69<sup>th</sup> annual meeting, Feb. 13-17, 2002, Dallas.
- 2002 **Gruber, H.E.**, Gregg, J.: Sub-chondral bone and bone resorption in the TMJ: Is there a role for anti-resorbing agents such as 17- $\beta$ -estradiol? Platform presentation, Second Scientific Meeting of the TMJ Association, Joint and Muscle Dysfunction of the Temporomandibular Joint, May 6-8, 2002, Bethesda, MD.
- 2002 Wattenbarger, JM, A. Marshall, **H. Gruber**, R. Meyer: The role of the basement plate in physeal bar formation. AOA Residents Conference Award. Poster presentation at the Amer. Orthopaedic Association annual meeting, Victoria, B.C. June 1, 2002.
- 2002 **Gruber, H.E.**: Intervertebral disc degeneration and autologous disc cell implantation. Dept. of Biology seminar, Univ. N. C. at Charlotte, April 26, 2002.
- 2002 **Gruber, HE**, Hanley, EN: Autologous disc cell implantation in a small animal model. International Society for the Study of the Lumbar Spine, platform presentation, May 15, Cleveland.
- 2002 **Gruber, HE**, Hanley EN, Leslie K, Ingram, J.: Human intervertebral disc cells: Selected cell carriers for tissue engineering. Poster presentation, North American Spine Society, Oct 29 – Nov 2, 2002 Montreal.
- 2002 Hanley, E.N., **Gruber, HE**, Phieffer, L., Banks, D., Coldham, G., Leslie, K., Ingram, J. Cell-based tissue engineering strategies for intervertebral disc therapy: Autologous cell implantation in a small animal model. Cervical Spine Research Society. Platform presentation. Miami, Dec. 5, 2002.
- 2003 Marshall, A, **Gruber, HE**, Wattenbarger, JM: The role of the basement plate in physeal bar formation. Platform presentation, Amer. Academy of Orthopaedic Surgeons, New Orleans, LA, Feb. 5-9, 2003.
- 2003 **Gruber, H.E.**, Gordon, B., Williams, C., Hanley, E.N. Jr.: Bone mineral density of lumbar vertebral end plates in the aging sand rat spine. International Society for the Study of the Lumbar Spine, 2003 meeting in Vancouver, CA, May 13-17, 2003. Poster presentation.
- 2003 Valerin, M, Brennan, MT, **Gruber, H.**, Padilla R, Ullrich C, Lockhart, PB. Magnetic resonance imaging as a diagnostic tool for pulpal status. Poster presentation, April 29-May 4, 2003 at the American Academy of Oral Medicine annual meeting in Tucson, AZ.
- 2003 Rude, R.K., Gruber, H.E., Norton, H.J., Wei, L.Y., Frausto, A., Mills, B.G.: Increased release of substance P and TNF-alpha underlie osteoporosis induced by Mg restriction in the rat. Poster presentation, American Society for Bone and Mineral Research.

Minneapolis, September 19-23, 2003. J Bone Mineral Metabolism 18(suppl. 2), p S155, 2003.

- 2003 **Gruber, H.E.**, Leslie, K., Norton, H.J., Heiner, D., Patt, J., Hanley, E.N. Jr.: Clinical, demographic and experimental characteristics of degenerative disc disease: Ethnic differences. Dec 11-13, 2003 meeting of the Cervical Spine Research Society at Scottsdale, AZ. Poster presentation.
- 2004 **Gruber, H.E.**, Ingram, J.A., Leslie, K., Hanley, E.N. Jr.: Cellular, but not matrix, immunolocalization of SPARC in the human intervertebral disc: Decreasing localization with aging and degeneration. Poster presentation, Orthopaedic Research Society, Mar. 7-10, 2004. San Francisco.
- 2004 **H.E. Gruber**, E.H. Sage, S. Funk and E.N. Hanley, Jr.: Targeted Deletion of the SPARC Gene Accelerates Disc Degeneration in the Aging Mouse. Poster presentation, 26<sup>th</sup> annual meeting of the Amer. Soc. for Bone and Mineral Res., Seattle, WA, Oct 1-5, 2004.
- 2004 Rude, RK, **Gruber, HE**, Norton, HJ, Wei, LY, Frausto, A, Kilburn, JM. Effect of dietary magnesium reduction to 25% of nutrition requirement on bone and mineral metabolism in the rat. Poster presentation, 26<sup>th</sup> annual meeting of the Amer. Soc. for Bone and Mineral Res., Seattle, WA, Oct 1-5, 2004.

#### F. MISCELLANEOUS ARTICLES AND PUBLICATIONS

- 1972 King, Keith I., Pribble, H.J., **Gruber, H.E.**: "The pond as a unit of study." Laboratory manual utilized in GS 101, General Biology, Department of General Science, Oregon State University, 1972
- 1990 **Gruber, H.E.**: "The bone biopsy: A window for viewing the skeleton." Quest, Science for Health, Cedars-Sinai Medical Center 2 (1), summer 1990, p. 9
- 1992 **Gruber, H.E.**: "Donor dollars: Providing a new look at cell structure." Quest, Science for Health, Cedars-Sinai Medical Center 3 (3), 1992, pp. 36-37
- 1992 **Gruber, H.E.**: "Take the drudgery out of typing references." Society for Ultrastructural Pathology Newsletter 15:3-4, October 1992